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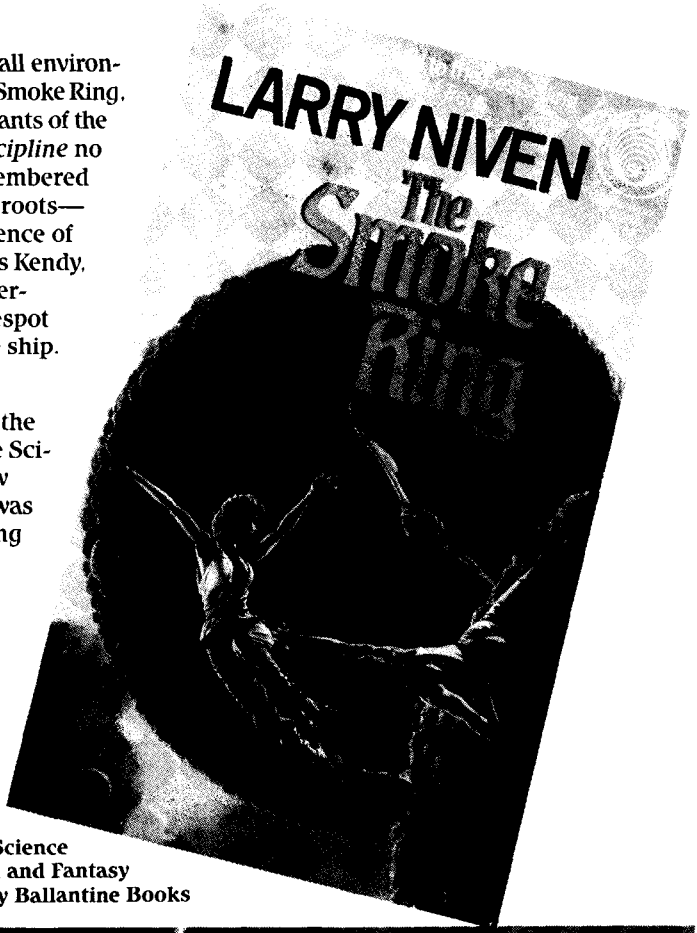

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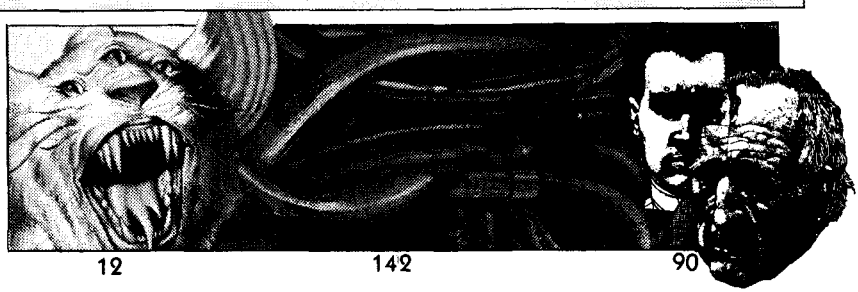

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Editorial

AN EXPERIMENT ON PEOPLE

Stanley Schmidt

Recently, while waiting for a misbehaving wisdom tooth to be removed, I found myself reflecting on the heated arguments I've heard over medical experimentation in general and the possibility of genetic engineering in particular. I can easily understand the concerns of people who would not want to see public or private institutions get into wholesale redesigning of posterity. There are big potential dangers, both obvious and not so obvious, in that kind of activity.

But (I thought) what good has a wisdom tooth ever done anybody?

I'll grant that I've heard of rare cases where one was encouraged to move into a space vacated by another tooth that had been removed—but there are other ways to replace lost teeth. With that single dubious exception, I don't recall ever hearing of anyone deriving any benefit from wisdom teeth—except, of course, oral surgeons who make a substantial part of their living removing them after they have become a threat or an active danger to their owners. For everybody else I know who's had any dealings with them, wisdom teeth have been at best a matter of indifference, and quite often the source of pain ranging from mild discomfort to prolonged and excruciating agony.

Now, my oral surgeon is a fine fellow and I wouldn't want to undermine his livelihood. But I *would* be interested in helping people minimize unnecessary pain and expense. So I got to wondering: if wisdom teeth do nobody any

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good, and often do harm, why do we have them? Immediate, obvious answer: because we are genetically programmed to have them. Next question: why? Some might say, "Because God made us that way." But why would He do that, if they don't help and often hurt? Was He being cruel, or did He make a mistake? Persons of theological bent are likely to find either possibility offensive and unthinkable, and dodge the questions by saying we have no business asking them. But "Ours is not to reason why . . . " goes against the grain of rational thought, and scientists do look for reasons. Quite likely, the reason we have wisdom teeth is that they *were* useful to longer-jawed ancestors. Evolution has since given us shorter jaws, but has not yet gotten around to getting rid of extra teeth we no longer need or have room for. (And it probably never will since, in our civilization, pesky wisdom teeth, while a nuisance, are not a threat to survival or reproduction.)

Until now, there would have been little more to say about the matter. We could understand why we have a feature that serves no real purpose and often causes trouble, but we could do nothing about it except cure the trouble surgically if and when it developed. But soon, if not quite now, we will be able to ask an additional question. Knowing why we have wisdom teeth in the first place, we can then ask *why do we continue to put up with them?* For the capability of *changing* human genes is quite close, if not already in some hands.

The mere mention of the possibility of "playing God" throws many people into hysterical outrage, and it is doubtful that those people will hear anything else I try to say. But I will try nonetheless. I ask you for the moment not to let your head fill with all the horrors that could come from unbridled genetic tampering, but to keep your attention focused sharply on the specific matter of wisdom teeth. Not that wisdom teeth as such are all that important, but they are a good example of a simple, common problem that nearly everybody can agree on, with no ethnic or moral connotations to muddy the waters. Nobody needs them, and many people would sooner or later be better off without them. Hardly anybody would see anything immoral about removing them when they have become acute problems. Why should it be any more objectionable to change the programming at the beginning to make sure the problem can never arise? Why should it be acceptable to *cure* the problem, but unacceptable to *prevent* it in a way that has no harmful side effects?

I'm well aware of the fear that, if such changes are allowed, some people might want to change things that are not so clearly intended to prevent harm. Should genetic diversity be sacrificed to create somebody's idea of a "superrace"? Should all children be made tall, or short, or black, or white? Should freckles be done away with because some consider them unsightly—or should everybody have them because others find them cute?

I'm not talking about any of those things. I'm talking *only* about simple, measurable traits which could be changed in a specified way that virtually everybody would consider entirely beneficial:

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from no benefit and some potential danger to no effect at all. Wisdom teeth are one example: as far as we know, nobody would suffer for lack of them, and many would benefit from never having to worry about the problems they often cause. There are other examples, such as the vermiform appendix. As far as we know, it does nothing for us, but it does sometimes become inflamed, requiring surgery or even threatening life. Again, why should it be socially acceptable to perform an emergency appendectomy, but not to make sure one will never be necessary?

I submit that eventually that question is going to be viewed very differently from the way it commonly is now. Many now would consider it morally indefensible to deny lifesaving surgery to someone who needs it. I suspect our descendants will consider it morally in-

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THE
TEAM SPECTRA
REPORT

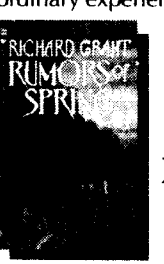
We probably shouldn't be telling you this, but when we acquired Richard Grant's novel **Rumors of Spring** (then called **Prelude and Forest**), we didn't really have any idea what it was about. But the fact was that the hundred or so sample pages which came from Richard's agent were *so* brilliantly written that we knew we needed to have this rare, wonderful talent on the Spectra list. So we signed it up and then called Richard to ask him if he could tell us where all of these incredible sentences were leading.

They certainly were leading somewhere. And when the final manuscript for **Rumors of Spring** came in, it was humming with energy and the story line became not only cohesive, but utterly enthralling. The tale of the crusade of a band of unlikely allies to the last rebellious forest on Earth, it is the kind of warm, intelligent, totally absorbing fantasy novel one sees all too infrequently. We fell in love with it immediately.

Lots of other people discovered how wonderful **Rumors of Spring** was when we published it in hardcover and trade paperback last year. The *Los Angeles Daily News* called it "a rare and marvelous tale." The *San Francisco Examiner* said it was "wry, hilarious and humane...a joy." The *Austin American-Statesman* dubbed it "a warm near-future fantasy...ably demonstrates Grant's abilities in what might be called the Ray Bradbury school of fantasy," and the *Philadelphia Daily News* said "like all good myths, **Rumors of Spring** is rooted in a rich soil of realism. It is a wise and compassionate tale." The *St. Louis Post-Dispatch* simply called it "delightful." And *Fantasy Review* really caught the essence of the reading experience when it said, "Richard Grant's prose is such that I kept stopping to think over an idea, or reread a certain turn of phrase or bit of description, simply because it was so good. If you enjoyed the way John Crowley pulled so many diverse elements so seamlessly together in **Little, Big**, then this book is for you."

You might be familiar with Richard Grant from his first novel, **Saraband of Lost Time**, which was the runner-up for the Philip K. Dick Award. But whether you've read him before or not, do yourself the favor of reading **Rumors of Spring**. It's a simply extraordinary experience.

Enjoy,
TEAM SPECTRA



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defensible to allow a useless and trouble-prone organ to develop in the first place. Those who now are terrified of genetic engineers "playing God" must eventually recognize that the difference between treating an acute disease in an adult, vaccinating a baby, and eliminating a harmful gene before birth is more a matter of timing than of the essential nature of the act.

Furthermore, not all genetically transmitted diseases or susceptibilities are as innocuous as impacted wisdom teeth or appendicitis. Those can be exceedingly uncomfortable, and even dangerous if untreated, but they can be cured quite completely by routine surgery. A few months ago we had an article here by Dr. Mark Peeples on Huntington's chorea, a neurological disorder that develops late in life, but for which the stage is set in the chromosomes—and for which no cure is known. An ethical question of today concerns what prospective parents should do if they know their children are likely to inherit the Huntington's gene. An ethical question of tomorrow will be what they should do if they know that their child *will* have that gene—but they can eliminate it before he is born. Similar situations exist with several other diseases, like hemophilia—and some of them, like sickle cell anemia and Tay-Sachs disease, have ethnic associations to further complicate the emotions surrounding debate over what, if anything, should be done about them.

Almost everybody agrees that pneumonia is a disease and should be treated. Suppose we all agree that *X* is a disease and we would treat it if we could—but we don't know how. If a treatment becomes available, but can only be applied preventively, by prenatal genetic manipulation, is the moral compulsion to use it less strong? Eventually, I think, the generally accepted answer will be *no*. But getting there won't be easy—and it probably *shouldn't* be *too* easy.

There *are* dangers, of course, of the sort, "If we allow this now, what will we allow next?" But those dangers come with any new capability. The fact that somebody could do something harmful with a new tool does not mean that *nobody* should ever do *anything* with it. It does mean that great care needs to be taken to insure that only qualified people will use it, and only for legitimate purposes. It would be foolish and dangerous to allow genetic engineers unlimited license to do whatever they want with genes. It would be just as foolish and dangerous to allow surgeons unlimited license to do whatever they want with patients' bodies—so nobody does allow that. As a result patients can be reasonably confident of getting beneficial treatment from surgeons, and many people are alive because of it who otherwise wouldn't be. Comparable benefits stand to be derived from genetic engineering—if judiciously used and regulated.

Naturally we should work our way into such things gradually, allowing time to work out unforeseen problems as they arise. I suggest that things like wisdom teeth and the appendix are good places to start. I propose an experiment: when the techniques are available, let's engineer those apparently useless and potentially dangerous parts out of a large

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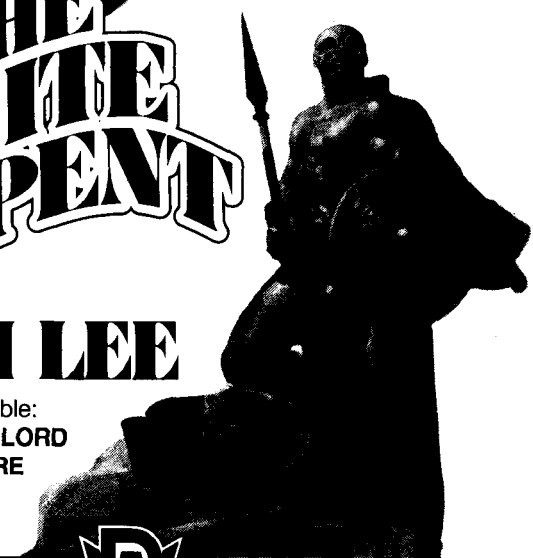

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number of the next generation. Not *all* of it—you'll notice I've emphasized repeatedly that *as far as we know* those organs serve no useful function. I recognize the possibility, however remote, that they may serve some function which has not yet been identified. I recommend getting rid of them in the population at large only if we're reasonably sure that doing so has no bad side effects that would outweigh the benefits. But it seems pretty clear that the useful functions of wisdom teeth and appendices, if any, are not obvious and will not become obvious through anything we can do with other experimental animals. They are likely to show up only through long-term statistical analysis of large numbers of *people*, with and without the modifications. The computers we already have, and even more the ones we can expect in the not too distant future, provide the means to do this.

So the complete experimental proposal looks something like this. First, genetically eliminate wisdom teeth and/or the vermiform appendix from a large sample of the next generation. Then let computers watch the medical histories of this group and a large control group without the modifications for any significant correlation between the genetic changes and any undesirable effects.

If any are found, a closer look can determine whether the changes are doing more harm than good, and if that is the case, they can be discontinued. What about the damage already done to those who were modified? They live with it (no great hardship anyway, considering how hard it was to find any benefit in the original programming), just as does any patient who's ever had an operation which his doctor thought was necessary but which later fell into disfavor. Pediatricians, for example, used to order tonsillectomies quite routinely; now they prefer to avoid them unless they become very clearly necessary. Doctors can treat only on the basis of their best knowledge, which is subject to refinement; that fact, and its ethical ramifications, will be no different for genetic engineers.

And if my proposed experiment shows *no* harmful effects of eliminating wisdom teeth or appendices, we might then confidently make those modifications standard practice for all new babies. To those who say some should be left unmodified even then, just in case those genes may yet turn out to have some value in unguessed future circumstances, I say, "Why bother?" If we have the ability to manipulate genes that freely, we can recreate the original configuration if we finally find a use for it.

And to those who still insist that "you can't experiment on people," I reiterate a truth I think I first heard from John W. Campbell: we are *always* experimenting on people. Every time a new law is passed, a new device invented, a new vaccine developed, a new idea promulgated, a new child raised—that is an experiment on people. Learning to do it well, and to derive all possible benefit from it, seems to me clearly preferable to pretending we don't do it at all.

Or would you rather continue to subject your heirs to a high risk of unnecessary pain and disease, when you could learn to prevent it? ■

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H'Tash watched the squat, black cigar-shape drift slowly toward the savannah. He stretched lazily, secure in his concealed position within the twisting buttress roots of a large tree. There was no fear in his observaton, no awe or sense of strangeness. He had never seen a spaceship before, but he knew, within limits, what it was and what it would do. The tiny knowledge carriers that lived in the earth had gifted him with that information. Long ago a similar craft had landed on H'Tash's world and been seen. Animals had recorded the incident in the genetic material of their flesh and blood. Tiny parasites had drunk of that blood, eaten of the flesh, and in turn, recorded the knowledge and carried it to their next host. Within a few years, every animal on the planet knew of the hollow things that came from the sky—and their contents.

Not that H'Tash was an animal; a pure predator he was: death and hunger packed into a massive, razor taloned, blunt faced hunter. He lacked the hands, tentacles or other manipulating organs which technological sentients use to build their civilizations, but he was far from being an animal. H'Tash thought and analyzed, and knew there were odd looking creatures inside that dark cigar shape, creatures which could be dangerous.

Danger is a relative concept, and, in H'Tash's mind, was a very transient one. For an instant, hunger thoughts rippled, then were discarded. He had fed well last evening; it was time to relax. More from habit than conscious act, he rolled to his feet, his chest expanding to expel a deep-throated rumbling challenge. "Huuuunnnnggh. Uunngh, uunngh, uunngh!" *Whose land is this? Mine, mine, mine!*

H'Tash squatted on his three powerful hind legs and stretched his forelegs against a buttress root. He purred in idle good humor and, with a muscular ripple of this three-meter-long body, scarred eighteen, four-centimeter deep furrows in the root.

H'Tash settled himself to watch the now grounded spaceship, the mottled fawn and brown coloration of his hair blending invisibly with the amber grass and patchy shadows. That hair was multipurpose: camouflage, ventilation and protection. The serrate margins of the broad, flat hairs could lock together like the ribs of a feather and form a tough armor, or they could separate and twist to control ventilation and skin humidity. Now they lay loose, close against his body, shifting slightly to increase his invisibility as wind moved the grass about him. Only the twitching tips of his trifurcate, prehensile tail showed the least hint of conscious movement.

Jorge Steigland leaned back in the control chair, unknowingly imitating H'Tash's movements. He stretched, waggled his jaw and yawned to reduce the ear pops of equalizing pressure. He scratched idly at his stubby black beard and focused on the being in the alternate control position. "Another day, another lousy uninhabited planet. How many more on this run, Fass'n?"

Fass'n grimaced. An expression which exposed rows of sharp pointed teeth: intimidating to anyone not familiar with his race's essentially easygoing nature. He was short, vaguely reptilian and centauroid. "Five," he answered tersely,

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preoccupation giving an unmeant edge to his voice.

Steigland nodded, scratched his beard again and belched. "So let's not waste time, shall we? Let's just collect the bloody specimens and get on with it."

Fass'n swiveled his chair and grimaced. "Jorge, if you don't like this kind of work, why'd you take this assignment?"

"Money, Fass'n. Money. All that lovely hazardous duty pay which I risk my tender skin to collect."

"Some risk," Fass'n snorted. "You lift this sodding zoo from one world, set it down on another, and fill in a batch of paperwork. The rest of the time, you sleep. I'm amazed you don't die of boredom."

"I know," Jorge grinned. "It takes every primitive sense I possess just to keep me from chewing the bulkheads in anticipation of the danger."

Fass'n chuckled, a strange and incongruously human sound, coming as it did from a reptile-like being such as Fass'n. "Jorge, you wouldn't know danger if it bit you in the ass. Why don't you go out with one of the collecting teams? Get some dirt under your fingernails."

"What, and get all sweaty grubbing around in two-meter-tall bush after things that don't want to be collected and prove it by chewing on the collector? Thank you, no thank you. Having danger bite me in the tender spot you just mentioned is exactly what I want to avoid. Arm wrestling the bar girls on Paterna is quite enough danger for me."

"So the medic told me," Fass'n chuckled.

"A scurrilous lie," Jorge huffed. "My elbow slipped in a wet spot. That sprained wrist was purely accidental."

"It wasn't your wrist I was referring to."

Jorge's reply was grumbled and unintelligible.

It drew a laugh from Fass'n. "Anyway . . . Time for living another chapter of 'the last great adventure.' What do the scanners show?"

"I haven't checked yet. I just got them warmed up and calibrated."

Fass'n's eyes flicked over the display screens and lifeform monitors. "How odd. Is something wrong with the equipment?"

Jorge studied the monitors. "Nope. The original survey ship got the same kind of readings. The bio-genetic pattern of the animal life on this sodding planet is so similar that nothing gives a distinct reading, just an intensified pattern where the larger critters are —usually."

"Usually?" Fass'n asked.

"The scouts' report wasn't real clear on the point. They suspected that a high density of small forms could read like a single large animal. Best we can say is that if the detectors show a bright spot, there's something alive that isn't a plant. Whether the pattern is caused by a carcass covered with bugs or a heppl sized eat-you/stomp-you is anyone's guess. You gotta find that out by going and looking, or sending out a flit-camera."

"Flit cameras scare off the game worse than floaters, and . . ."

"So go take a walk and make eyeball contact," Jorge interrupted, "but, don't come back complaining to me if the blip makes a meal of you."

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Fass'n elevated a brow ridge and waggled his crest. "Preventing such accidents is what we have repellor fields for."

Jorge shook his head. "Recheck the scout report, Fass'n. The animal life on this world seems to be able to ignore our repellors. Every time the scouts found a setting that worked, it stopped being effective within a couple of days and they had to recalibrate." Jorge pursed his lips and looked worried. "I'd be real cautious about trusting mechanicals on this world. Fact is, I'd be real cautious, period."

Fass'n was silent, eyes hidden by nictating membranes as he thought. The membranes opened briefly to study the instrument displays, then slid closed again. After several moments they flicked open and he faced Jorge. "Much as I dislike using amateurs, this time I fear I shall have to call upon you for collecting. The conditions seem to preclude gathering sufficient specimens in the allotted time, otherwise."

'Whoa!" Jorge protested, "I'm a pilot, a Federation employ, not a contract big-game hunter."

"We are *not* hunters!" Fass'n snapped. "We are collectors."

"There's a difference?"

"Distinct. We do not kill, unless there is no other way to protect ourselves. We collect live specimens, not dead bodies."

Jorge's grunt was noncommittal, as was his expression when he continued. "Nevertheless, the closest *I* want to get to anything that resembles those critters the scouts holo'd is a hundred meters up in a floater—or better yet, in a zoo with a good thick slab of armorplas between me and it!"

"Then I will assign you to collect small, relatively harmless species, but collect you will; it's in your contract."

Jorge grimaced and growled.

"At least you won't be bored, Jorge," Fass'n laughed. "Who knows, you may even get a new species named in your honor. I can just see it; Runtowhoosis steiglandiana, famed throughout the civilized galaxy as being the laziest, most cowardly animal ever discovered."

"I can do without the fame and glory," Jorge said grimly. "Those honorary namings tend to be posthumous."

The rumblings of hunger woke H'Tash as the sun made its daily slide into oblivion. Catlike, although little but his temperament and grace bore any resemblance to a Terran feline, he rolled on his back and stretched, tripleted legs quivering in the hot, acrid breeze that preceded sunset. With a sinuous movement that belied his 2,000+ kilo bulk, he rolled over and sat up, nostrils dilating, his striated, wing-like ears unfolding, blending into the grassy background. For a moment he sat, eyes, nose and ears searching; absolute in his concentration. Faintly, he caught the alien scent of the starship. More intense, and of far more interest, came the smells of grazers on the move toward water, hurrying before darkness arrived and left them thirsty and afraid to lower their heads to drink. H'Tash rumbled his contentment. Those grazers would provide his dinner. Haste reduced their alertness. He would be first to water, slake his own thirst, then lay his ambush.

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With a flowing motion, H'Tash moved from his concealment into the scrub and grass. The grass barely quivered as he passed.

H'Tash moved swiftly but not carelessly. He was moving with the wind, and there were things one did not blindly blunder into and survive: saber-grass for instance, lethal and lurking, waiting to stab out and suck dry any who passed in range; or a herd of the great trihorned herd grazers. He had seen the results of such carelessness more than once: the torn remains hammered into the earth to nourish the tiny ones who lived there. Bulking five times H'Tash's own weight, a tri-horn was a dangerous opponent. Their trifurcate tails could grasp and tear an attacking predator from their backs, exposing the hapless attacker to raking horns or stamping hooves. Even badly injured ones were dangerous. The only non-dangerous tri-horn was a dead one.

Experience led H'Tash safely to his objective. In places rock underlay the terrain, stunting plant growth and forcing the water to the surface. It was to the large pools that the grazers came to drink.

The grazers already at the water hole were of no real interest to H'Tash. They were far too wary, keyed to near hysterical alertness by their exposure. One of the small, blurringly fast grass hunters might pull down a minor grazer at this pool, but not an animal of H'Tash's bulk. The grazers would leap wildly and be gone before he'd covered a tenth of the distance toward one. They would flee soon enough anyway as H'Tash moved upwind to set up his ambush.

A long humming sigh of pleasure eased from H'Tash as he moved around the pool, a sigh barely audible above the whispering of the afternoon breeze among the grass and brush through which he slipped.

A half-seen movement froze him in mid-stride.

A medium-sized grazer eased cautiously from the security of the brush onto the hard packed clay surrounding the water-hole. Daintily, ears expanded, nose twitching, eyes wide and shifting nervously, it edged toward the water.

H'Tash's eyes fixed on the grazer: the binocular outer eyes giving range while the muscle control centers of his body locked to the central eye, which, like a missile guidance system, fastened on the every shift and twitch of the grazer. H'Tash's form was a tawny blur as he burst from a concealment. The grazer's legs windmilled in fear. It made one panicked bound before H'Tash was on it, the talons of his outer paws digging into the grazer's shoulders, the central paw forcing its head down, exposing the fragile vertebrae of the neck to the hunter's teeth.

The rest of the drinkers exploded into terrified motion and dashed for safety.

The kill was clean and swift. In seconds, H'Tash was settled beside the body of the grazer, his stomach rumbling pleasantly in anticipation.

Suddenly H'Tash sprang straight up with a squall of pain and anger. A red flagged gleam of silver protruded from his side. He spun, snarling, raking at the thing with a paw, knocking it free, only to have another appear, then a third and a fourth. When the fourth struck, hunter became victim and collapsed in a heap. He never heard the voices of the collectors who had made him prey.

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"Judas!" Jorge exclaimed as he drifted the floater to a landing beside the pool. "Will you look at the size of that thing."

"Rather an efficient predator for all its size," one of the collectors remarked. "It took out that horned thingy with one swat and a bite. Tough bugger, too. Took four darts to knock it out." The collector recovered the darts from the unconscious H'Tash, glanced at the slack-jawed Jorge and suggested, "Be a good lad, Jorge, and help us load it into the cage. I'd really not care to be standing here if it happened to come around suddenly. Not too healthy, don't yuh know."

"Cripes, Briant," Jorge groused almost to himself, "you British would understate the end of the universe."

"Not quite," Briant chuckled, "have to shout over the noise, I'd expect."

"Less yak and more help," a second collector grumbled. He was a squat nonhuman who looked a bit like a giant frog dressed for a costume party. "Let's load this whatever-it-is, and the critter it was about to eat, and get back to the ship. That sun is low, and there isn't much twilight in these latitudes. Infra-red or no infra-red, I'd rather leave the night hours to the teams equipped for it by birth. Trog here," the collector tapped his own chest, "is strictly a diurnal type."

Jorge was just as nervous about the impending night as Trog. He tried to mask his concern with a prod at the collector. "Wat's a matter, Trog? 'Fraid the great celestial heron is gonna spike you up for supper?"

"Funny, Jorge," Trog replied, jerking a noticeably webbed thumb at H'Tash. I'm more concerned with this thing's friends or his big brother."

"Big brother?" Jorge asked.

Briant nodded and cinched the restraints tighter about the unconscious H'Tash. "Damn straight. How the hell do we know what stage of growth this thing is in? For all we know, it may still be a baby. D'you want to wait around for Mama?"

Jorge clenched his teeth and doubled his speed. He definitely did *not* want to meet mama. Not if it took four Quick-sleep darts to put down junior. Jorge wanted nothing more than to be back at the ship, drink in hand and mind far away from the demands of animal collecting. Twenty minutes later his wish was partially granted. He was back at the ship.

"Responses are still negative," the expedition biologist stated in a disgusted tone. "How the hell much Quick-sleep did you hit this thing with?"

"Just enough to put him down, old chap," Briant answered. "Four ampoules." Trog and Jorge nodded confirmation.

"Four! For Way's sake, that's enough to founder a nine ton heppl, let alone something this size!" The biologist held up a tiny creature in a pair of forceps. "Look at this! You hit him with so much, you damn well killed all the parasites attached to him. It'll be a bloody miracle if this animal survives, even with antidotes." He glared balefully at Briant, Trog and Jorge, then shifted his attention back to H'Tash strapped to the floor of the floater's cage. "Well, we may as well get *some* information. Float him into the lab bay and help me get him strapped to a table."

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"You want us to take him *out* of the cage?" Jorge asked. "What happens to my tender young body if he comes to?"

"Not a damn thing," the biologist growled. "First of all, my monitors would give plenty of warning if this thing started to awaken. Secondly, it's going to be fastened with straps a beast five times this big couldn't break. And lastly, I'm more worried about it recovering at all than I am about it coming around suddenly."

Jorge muttered but helped. When H'Tash was secure, he climbed back aboard the floater. "I hope you heroic scientist types won't need me for a while. I'm gonna park this floater then have myself a nice stiff drink."

"Not at all, Jorge," replied the biologist. "Go go brutalize your liver as much as you like. We can move this thing to a stasis box ourselves."

"Good," Jorge said in a flat voice. "*You* play with that monster; *I* want nothing more to do with it." He backed the floater out of the bay under the tolerant grins of the biologist and the two collectors. "Want me to auto the bay door?" he called.

"Thanks for the thought, Jorge," the biologist told him, "but leave it open. The breeze feels good after three weeks of canned air."

Jorge nodded and swung the floater toward the parking bay. Twenty minutes later he sighed as he rolled a glass of Vilette in his palm. "I wonder if I should go check on how things are going in the lab? Nah. They need me like a hole in the head, and I'd just as soon keep a lot of steel between me and that big predator." The scene of H'Tash bringing down the grazer replayed itself in Jorge's mind. "Jeesh. Anything that can bite through the neck of three quarters of a ton of mad muscle is something I can do without. Way! Just thinking about that thing has me talking to the walls. Enough already; I'm for bed."

The decision was wise. In all probability, it kept Jorge among the ranks of the living and ambulatory.

H'Tash was groggy but far from unconscious. Neither was he stupid. He had lived long enough to know when appearing dead, or at least unconscious, could keep one alive. He had survived the attack of a lone tri-horn bull in just that way. The bull had thrown the hapless H'Tash into a patch of scrub then ignored him when H'Tash had played dead. It had been a lesson the young predator had taken to heart. He applied it now.

Deep within his body, organisms analyzed, isolated, then neutralized the Quick-sleep, rendering H'Tash immune to its effect. If H'Tash managed to escape, the tiny creatures that carried information would spread that immunity to any animal they chanced upon.

H'Tash played the game, letting his body's organisms work and waiting for his opportunity. He didn't even twitch when the biologist took deep tissue samples with a fine, hollow needle.

"You've got the structural scans and tissue samples," Trog stated. "What next?"

The biologist checked the displays on a bank of monitoring equipment. "I think the next step will be to load it into a statis box."

"Briant," he addressed the British collector, "move that rig over here, will you?"

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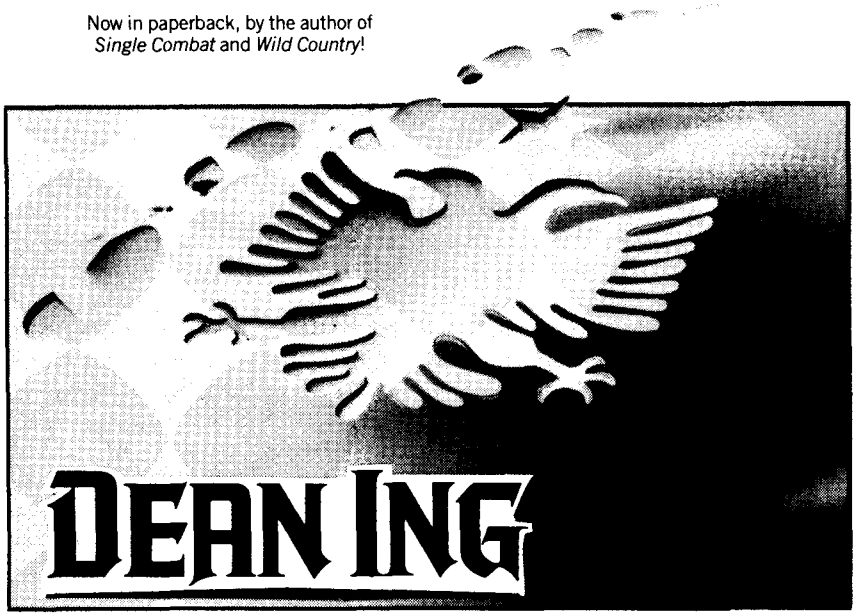

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"Need help?" inquired Trog.

"No, I think we can handle it with the remotes. Take a break, then we'll look at the critter this boy was going to have for dinner. The more we know about these animals' biochemistry, the easier it will be to keep them healthy when they come out of stasis."

"Logical," Trog remarked, strolling to the open bay doors and breathing deep of the night, admiring the bright moon that draped ghostly shadows over the grasslands. *A hunter's moon,* he thought, and wondered idly how the nocturnal collectors were doing.

Trog watched the night while Briant concentrated on positioning the handling equipment. The biologist, after a quick check of his monitors, began releasing the restraints from H'Tash's body and limbs. No one noticed the sudden jumps and wiggles of the meters and graph lines as H'Tash brought his body to peak readiness.

The removal of the restraints was what H'Tash had been awaiting. As the last clicked open, he exploded. One paw became a tan and brown flicker of death led by razor edged streaks of crimsoned ivory. Even as his paw bludgeoned and carved the biologist's head from his shoulders, H'Tash was turning his attention to the collector.

Briant barely had time to squeak as a blue cavern lined with amber tinted sabers opened in front of his eyes, then snapped shut.

H'Tash's tongue passed the tidbit of bone, meat and brains back to his chewing teeth as he lunged for the open bay door.

The sudden noise made Trog spin about on his splayed feet, feet which were attached to legs designed for leaping or swimming, not abrupt turning maneuvers. For an instant he flailed wildly, framed by the moon and silver savannah behind him, then, with a despairing shriek, he toppled backwards.

H'Tash had been aiming at Trog's head, outer forepaws positioned to grab the shoulders while the center paw ripped into the groin and the killing fangs performed an impromptu lobotomy. Trog's self-perpetrated fall, and the remaining effects of the Quick-sleep threw off H'Tash's timing. The center forepaw raked Trog, but the outer paws and teeth missed their targets. Instead, the impact of the center paw knocked Trog completely clear of the side of the ship, hurling him outward to land with a soggy splot on the hard packed earth four meters below. He was torn, broken and unconscious, but alive. Trog's race is rugged; a returning noctural collection team would find him before he bled to death. In a week he'd be up and cursing because he couldn't get more exercise.

For an instant, H'Tash considered collecting Trog as a replacement for his missed supper. Awareness of just how dangerous these strange beings could be removed the consideration. He would make do with the small nourishment the collector had supplied until he could bring down something more substantial. H'Tash moved away from the ship at a kilometer eating lope and headed for a lock-horn bedding area.

Later, between munches of lock-horn sirloin, H'Tash decided he'd been very, very lucky. H'Tash needed knowledge. It wasn't curiosity—that particular characteristic was lacking in his intellectual makeup—H'Tash never sought knowl-

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edge just for the sake of knowing. Rather, it was an awareness: if he was to combat the strange beings who were usurping his hunting rights, he needed to know his enemy.

H'Tash knew of only one sure way to get that knowledge, by finding, killing and eating one or more of the aliens. Knowledge lived in the flesh, therefore to its source he must go. H'Tash began to plan, very carefully.

A cautious week later, a week spent far from the alien ship, H'Tash settled on his first move, simple observation. He would begin at dusk when he knew the aliens were active. With a grunt of resolve, he headed for a layup reasonably near the ship: a hollow tree stump almost buried in scrub and grass. Several times during the trip, he flattened himself into a gully or a patch of scrub as the wind brought him the smell of alien, or as his keen eyes saw distant flying things with outlines no native beast possessed.

Even in the safety of the layup he remained tense, nostril flaps open and ears flared, alert for sound or smell that might warn of approaching danger. After a while, when nothing unusual impinged on his senses, H'Tash closed his ears a bit, damping out the whine of the small insect-like creatures enlarging their home within the decaying stump, and dozed.

Unknown to H'Tash, it was the biomass of those termite-like creatures that kept him safe from detection. Three times floaters passed over his head, ignoring the readings their sensors gave. They had checked the stump carefully near dawn and found nothing but "termites." Now they watched only for movement. There was none from within the stump.

H'Tash woke well before sunset, coming from sound sleep to full alert with a speed no civilized being could comprehend. With equal speed he was aware of what had awakened him: a spine covered "termite" eater ripping at the log to reach the delicacies beneath its bark.

For an instant, H'Tash considered driving a paw through the thin surface of the stump to hook the succulent animal fumbling about on its surface. The spiny animals were tasty morsels, but almost impossible to acquire. Their thick armor of bony plates and short poison bearing spines protected them from direct assault. Only the soft underside was open to attack, but to reach it one had to get past the barrier of spines. The risk outweighed the gain for any except a starving predator. But an unexpected underside attack just might work. A swift, eviscerating slash . . .

Hunger was overcome by caution. One did not hunt or kill near one's layups—not unless one wished to find some territory seeker lying in wait to contest the matter. H'Tash resheathed his claws with a mildly frustrated grumble.

To most, that grumble would have been inaudible. It was not inaudible to the "termite" seeker. He heard; he heeded; he packed up shop and hustled off through the scrub.

H'Tash watched him bustle off, grumbling and muttering. The self-important pomposity of the beast made H'Tash rumble quietly in amusement. Another day, he decided, he would try

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the log trick in another location. It had interesting possibilities.

H'Tash was not alone in observing the quilled animal. A solo collector, prowling on the edge of the tree-line in a null-grav harness noted the movement on his helmet scanner. He quickly aligned the targeting scope in his helmet, feeling the harness mounted dart launcher swivel in response. When the targeting circle went steady, he tripped the launcher.

H'Tash froze in the shadowed security of his layup as a red fletched dart blossomed among the spines of the bustling animal's back. Danger alarms clamored in H'Tash's mind, urging flight. H'Tash ignored the alarms. It had taken four of those things to lay him low the first time. Four widely spaced.

H'Tash could do a lot of killing in the time it took four of those things to reach him, particularly when he would be the hunter to begin with. *Where,* he wondered, *are the aliens, and how many are there?*

He turned his senses away from the now twitching "termite" eater and directed them toward the source of the dart. He was rewarded with a strange noise, at the upper limits of his "hearing," a strange burring hum which ran rasping, irritating tendrils along his nerves. He was "hearing" the 1,200 kilocycle buzzing of a slightly off tune null-grav unit.

Seconds later, the collector, a small, tawny furred Cythian dropped lightly to the ground beside the animal he had darted. "Homely little rodent, aren't you," the Cythian lisped as he carefully retrieved his dart with a pair of long handled forceps. He didn't know if those spines were poisonous or not, but he had no desire to find out the hard way. A fraction of a second later, he had no desires at all.

Acute senes and equally acute instincts, both honed by years of survival in a very unfriendly world, told H'Tash that the hunter was alone. He could sense the aliens' detection gear when it swung across him; he had "felt" it just before the "termite" hunter had been downed.

To know was to act. The Cythian barely had time to sense danger, let alone realize it. The fur of his crest and back was still only half erect when H'Tash's fangs sliced through his neck. The Cythian's eyes bulged in horror at the ivory tinted hooks imbedded in his chest and the flare of agony at the back of his head. He wondered, in a fleeting microsecond, why there was pain in his skull and none in his chest, then his brain told him he was already dead, and all sensation was swept away by the night that precedes eternity.

"Has Lyssthk reported in?" Fass'n asked.

"Not since before noon," Jorge told him. "He's five hours overdue."

"Marvelous," Fass'n almost snarled. "One man in the hospital, half torn to shreds, two dead, and four missing."

"*Four* missing?" Jorge asked.

"We lost an entire collecting team in the forest last night. A search party found their floater this afternoon, but no team."

"What about their equipment: the emergency beepers?"

Fass'n gave a good imitation of a grimace. "Bits and pieces found a half

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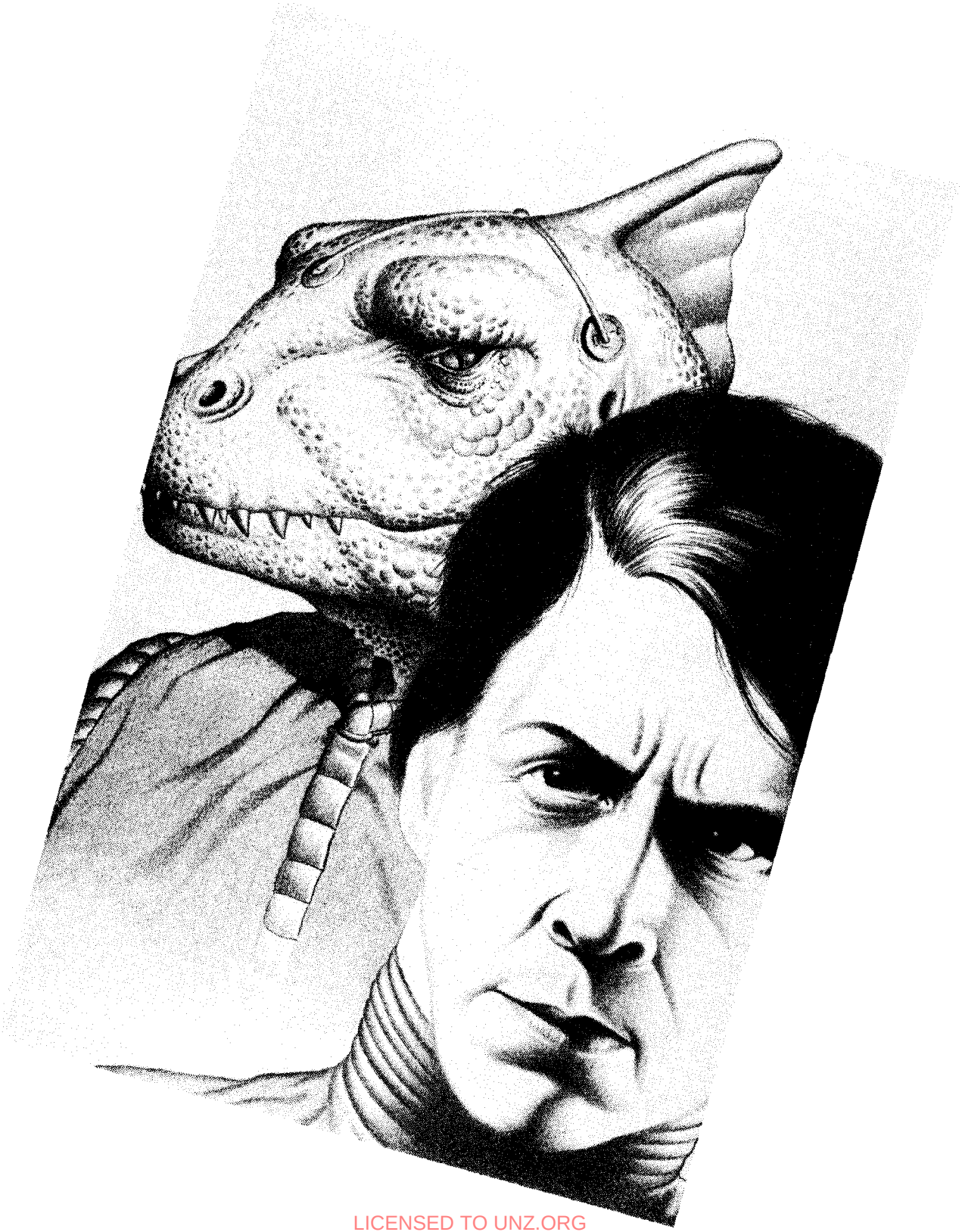

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a klick from the floater. It looks like they tangled with something they couldn't handle."

Jorge hesitated, then decided. "Fass'n, this planet is turning into a real witch. We've lost six men out of twenty already—excuse me, eight. I forgot the two who almost ended up as fertilizer for that weird plant. If Winnicker hadn't hooked them free from a distance, they'd be dead, too. As it is, they'll be another week in sick-bay recovering. And, we have damn little to show for our losses. Less every day. We've had to change the anesthetic five times, and the game is harder and harder to find. All we're getting is slow stuff that's restricted to a small territory, or herd animals that are too big to hide. Big stuff, solitary stuff that can move. . . ." Jorge snorted in disgust. "It's as if the animals know what we're doing before we do it. Admit it, Fass'n, we've bit off more than we can chew. Let's pull the field crews and get the hell out of here!"

Fass'n grimaced as if he'd swallowed bitter-berry. "Can't do it, Jorge, economically *or* ethically. Not until we know those four missing men are really dead. I'm going to run a couple of three man crews to search for them. I'll take the day crew, leaving you to hold the fort while the nocturnals sleep. Then after dark, they can take over the searching. There will, however, be no direct collecting. We'll use traps for small stuff and leave the big boys alone."

Jorge grunted noncomittally. He didn't like it, but Fass'n was the boss while they were grounded.

Fass'n gave him a wry gesture and opened the control room door.

Trog limped into the control room as Fass'n left. "Fass'n doesn't look real overjoyed."

"You're a better man than I am," Jorge told him, "if you can read that overgrown crocodile's emotions. But no, he isn't very happy. Would you be if a fourth of *your* crew had been eaten by creatures known and unknown?"

"Who said they'd been eaten?" Trog asked nervously. "Doc and Briant were just . . . uh . . . torn up."

"Except for half of Briant's head, which is notably missing. As for the rest, wanna bet?"

"Uh . . . How come you're so sure when Fass'n isn't? He's supposed to be the expert on zoology."

"Trog, old frog, I grew up on Terra in a place called Zambia. That's prime country for getting chopped by things that go on four legs—even in this day and age. I've *seen* what a hundred and twenty-five pounds of leopard can do. Ever seen the way a leopard kills?"

Trog gave Jorge a wide-eyed shake of his head. "Not sure I want to, either."

"You saw Briant, didn't you?"

"Ugh! Yes, unfortunately."

"So did I. Except for the size of the chop, if anyone had shown me an "after" picture of Briant, I'd have given three to one that it was the work of old Chui."

"Old Chui?" asked Trog.

"One of a number of names for a leopard. A rather apropos one, actually. He ranks Homo the Sap rather high on his come to dinner list."

"Gahhgh," Trog remarked with feeling.

"To you, maybe," Jorge replied with

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a wicked grin. "To Chui, smorgasbord."

"I repeat, gahhgh! I think I shall return to sick bay. I'm a lot less well than I thought."

"Obviously," Jorge quipped and went back to checking the comm channels of the crews who were searching for the missing.

H'Tash slept deep in a boulder pile that night with a full stomach, courtesy of the "termite" eater and the unfortunate Lyssthk. Despite the full stomach, it was not an easy sleep. H'Tash was confused. The knowledge he had expected to gain had been absent. A few racial memories, but nothing real, nothing current. It was as if the alien hadn't actually existed—at least not as H'Tash understood existence. Even grubs and the tiny earth dwellers knew who they were and what they did. Only plants had no active genetic memories.

Could this alien have been some strange motile plant, unsentient, not really *alive?* H'Tash rejected the concept in confusion. The alien hadn't acted like a plant. He had behaved with purpose and method, using "things" beyond H'Tash's comprehension.

The concept of tool use was not strange to H'Tash. He himself had rolled stones into cracks to frighten forth the dwellers therein. But the idea of using tools which themselves used tools—the alien had not thrown the dart, he had used another tool to propel it—felt uncomfortably odd in H'Tash's mind.

H'Tash gave a sigh and drifted off to sleep. Perhaps the next alien would be more informative. If the next, he thought sleepily, tasted as good as this one, the search for knowledge would be more than enjoyable.

Life doesn't always go as planned, and a minor sprain suffered by a collector put Jorge back in the field, on the ground and hating every second of it.

He stared at the location where the trap had been and cursed. Brush and grass was uprooted and crushed. Jorge studied the scene.

Drag marks led off into the bush, toward a thick stand of low-growing trees surrounding a tumbled pile of boulders. The story was obvious, the animal had been too large for the trap. Perhaps it had worked a paw—or even its head—into the trap to get at the bait. Probably, Jorge thought, a scavenger or an injured predator. Lately they seemed to be the only ones stupid enough, or desperate enough, to wind up in even the most carefully concealed trap. The trap had sprung, and now, somewhere within that blank tangle of scrub, saber-bush and rock, an injured animal was dragging it around.

Whatever the case, Jorge had to go after it—on foot. The floater was no use when the ground was hidden by foliage, and the floater would be impossible to maneuver through the trees at ground level.

Jorge cursed again, checked the settings and charge of the combination blast/dart rifle he carried and began following the drag marks—with extreme caution. Injured animals had a nasty habit of doubling back and waiting for the hunter. The results for the hunter were frequently messy, unpleasant and terminal.

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The signs, crushed grass and bright, naked scars on trees created by the banging of the metal trap went straight for the pile of rocks. Jorge followed, one careful step at a time, with long, long pauses between to study the brush on either side and ahead.

A glint of that metal, ahead and to the left of a small clearing, brought Jorge to a quiet stop. The wind was in his face. It gave him an edge and he moved quietly around the clearing toward the gleam of metal, keeping to the screen of brush, the hunting experiences of his youth coming into play automatically.

At thirty meters, he could make out the form of an animal among the low scrub and grass: one of the medium sized scavengers, dangerous at close range, but not something to cause alarm at this distance. The door of the trap had snapped shut on one of the animal's front legs.

Jorge switched the rifle from blast to dart. He carefully rested the weapon against a tree, let the laser sight lock on the target and fired. The scavenger snarled and lunged, then collapsed. Jorge breathed a sigh of relief and reached for the comm unit at his belt. A second snarl, angry and challenging, froze his motion.

One cannot always travel into or across the wind. To round the pile of rock, H'Tash, was forced to travel almost directly downwind. Under these conditions, only his eyes and ears were of use to warn of danger. It was his ears that brought him to a snarling halt at the edge of the clearing. It was his ears that heard the soft whoop of the dart launcher, and the snarl of the scavenger. It was his eyes that registered the animal's collapse and the bright dart at the base of it's neck. It was also his eyes that fastened on Jorge less than ten meters away holding one of the death tools in his hands.

Jorge's eyes found H'Tash at the same instant H'Tash's found him. Paired, oval eyes of grey stared into tripleted, triangular eyes of cold jade green. The intelligence in those jade eyes would haunt Jorge for a very long time, and H'Tash would remember the chill speculation in Jorge's gaze for an equally long time.

Time and fate sat and wove invisible webs while the two sorted themselves out.

Jorge was the first to move. The rifle was still set on dart, and he knew how many it would take to put down the creature facing him: too many. Neither could he risk switching to blast. Jorge knew just how fast and lethally a beast of H'Tash's species could move. By the time he made the switch, found H'Tash in his sights and fired, the beast could be spreading various parts of Jorge all over the clearing. He did the only thing he could, he began slowly backing out of the clearing, looking to put a solid tree between himself and the huge hunter he faced.

For his part, H'Tash wanted nothing to do with the dark, lethal thing in Jorge's hands. He had seen that tool in operation before. He might want Jorge's flesh for the information it contained, but he feared and respected that long black instrument—and the holder's ability as a hunter to use it.

For an eternity hunter faced hunter. Then it was over.

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When Jorge began to back away, H'Tash reacted in kind. He snarled and hurled himself back into the brush from which he'd stepped eternities before. Information could wait for another, safer time.

Other hunters were not so wise.

"Son of a—" Jorge managed to keep the floater steady despite his shock, he still trembled in the night from his encounter with H'Tash a week earlier. Before his eyes his nightmare was coming to life—almost. At least he hadn't been the target. The animal had exploded from the brush in a blur of red-brown and amber stripes. The streak of motion had been followed by a pulsing snarl from the projectile launcher in Fass'n's hands. "Is Walsh OK?" Jorge called.

"I can't tell for sure! Get us down!"

"Right." Jorge's reply was flat and unenthusiastic. "Just what I want to do on a sunny afternoon," he muttered to himself, "park a floater in a patch of brush full of things that go chomp. See the universe, become a gourmet item."

"Cover me," Fass'n snapped and handed Jorge the rifle. A heave, and the predator's tattered carcass rolled aside to reveal Walsh. Fass'n quickly pulled Walsh into the floater, checked him, then stepped back outside to snap the lift ring onto the top of the trap. An instant later he was back aboard. "Up," he ordered, taking back the rifle. "We'll grapple the striper's corpse from a safe altitude."

Jorge hastened to oblige, thinking, *I wonder what a "safe" altitude is?* "How's Walsh?"

"Bloody— not his blood, thank the Way—bruised and out cold. He seems to be in one piece. The striper was dead before he landed on him."

"That's good."

"We were damn lucky," Fass'n remarked in disgust. "Next time we double check the area around a trap from five meters up before we ever open the floater's door. And maybe plunk a few hot ones into the brush to make *sure* we don't have company."

Jorge shrugged, as long as *he* didn't have to get out to set or pick up the trap, he didn't care where they checked from. He asked skeptically, "Think the critter went after Walsh because we were trying to make off with his chosen dinner?"

"No," Fass'n stated flatly, confirming Jorge's bleak suspicions. "I think he had us on his menu from the start. Why go to all the effort of busting into a trap when food on the hoof will be along to collect it?"

Jorge nodded unhappily. He didn't like the conclusion, but he couldn't avoid it either. He'd seen it happen before.

Firsthand observation of the novel ways in which an animal could turn the tables on a hunter and ruin said hunter's afternoon—not to mention evening, morning and high tea—had settled Jorge on an occupation as remote from the bush as he could get. *So,* he thought, *where do I wind up? Right back in the bloody-be-damned bush, of course.* "So now what, Fass'n: pack up and head for home?"

"With what we *haven't* collected? You have the cash to pay for this trip if we don't complete the contract? Government contract work pays good, but

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the penalties for non-performance are high, too. We'll get as much as we can here, then see if we can pick up some additional staff enroute to our next collecting stop."

Ah, for the life of an independent contractor, Jorge mused sarcastically. *Thank the Way, ship-command crews work directly for the Federation and aren't affected by contract penalties like the collection team.*

H'Tash snuggled deeper into the crevice which split the blank stone of the rock pile and watched as the floater dropped a hooked object on a thin line and lifted the remains of the striped hunter. He watched with the same patience that had kept him prowling and observing for the last thirty risings of the sun. He watched, and he learned. In one way he had learned to fear being hunted: a new and unpleasant experience. More, he had learned respect for the alien's "tools." Many days ago the aliens had given up using the sharp tools that caused numbness. Only rarely did the aliens ever leave their floating caves. Now they lowered these metal things containing food of various sorts, coming back to claim them when something had wandered inside and been caught.

Their behavior fascinated H'Tash, even as it frustrated him in his hunt for knowledge. He had never seen traps before; the concept hadn't existed in his world before now. The idea of *caught,* yes. Falling trees, loose rocks, hungry teeth and talons: these things "caught" the unwary. But a thing which attracted the prey, then secured it for, H'Tash assumed, later leisurely killing and consumption . . . that was new. So was the idea of deliberately placing food in a convenient manner to attract the prey.

Other knowledge had been gained as well: the nature of the chemical which paralyzed without killing, the strange and meaningless rituals the aliens had performed on H'Tash's body, and, most intriguing of all, the way in which they worked together, prey like, to achieve an objective. The effectiveness of that cooperation made H'Tash think some very new thoughts for a member of his species. *Hunters who cooperate . . . other than to breed . . . and gain strength thereby. How novel. How interesting. How . . . useful?*

More immediately of value, H'Tash thought, was the idea of using something which might draw that prey to the hunter. H'Tash had an application for *that* concept. With a satisfied rumble, he waited until the aliens were gone, then set off at a steady lope for the rock pile where he'd consumed the late Lyssthk.

It took over ten risings and settings of the sun for H'Tash's idea to bring results; the alien had become more cautious, harder to find, harder still to predict, but H'Tash endured the wait with the patience of the born hunter.

When the floater did come, it came in the dark. As the floater approached, H'Tash wriggled deep into a crevice.

The opening in the scrub was small, alluring for the placement of a trap, but difficult to reach, the ideal spot being under a slight overhang at the edge of a well used game trail. The floater would have to land, and one of the aliens would have to place the trap by hand. They would be wary, cautious; but perhaps not cautious enough.

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Five times the floater circled, studying the heaped and tumbled boulders and the cracks and crevices that could hide anything. Five times it scanned the rocks with sensitive life detecting instruments. Five times the instruments detected mass upon mass of rock-dwelling life, blurred, shifting and meaningless. Five times the tips of H'Tash's tails twitched, then the floater settled slowly, nervously, into the clearing.

H'Tash could hear the rattle and patter of the alien's voices. He knew there had to be meaning in that sound, but it was complex beyond his experience or comprehension. Their gestures were more informative. H'Tash flattened himself until he became one with the rock, watching with one eye through a narrow crack between two smaller boulders. Hope surged, and with it confidence; one of the aliens was pointing at the game trail and the overhang. It lifted one of the gathering/holding things and stepped from the opening. Another, standing behind the first, held a death tool in its paws. The floater began to rise. *Soon*, H'Tash thought, *it will have to be soon or not at all*. He ground his chewing teeth in anticipated frustration. If the hunter failed to see, or the floater lifted too high . . .

There was a sudden staccato patter of sound from the collector on the ground, then a slight clash of metal as he dropped the trap he carried. H'Tash saw the alien bend, then disappear from sight as he attempted to reach the grav harness which H'Tash had wedged under the rock.

The tension in H'Tash snapped like a dry twig. For a brief instant the attention of the aliens in the floater was on their companion. In that instant H'Tash rose, took three swift, almost silent, accelerating steps and hurled himself through the floater's open door. The scrape of claw on rock as H'Tash launched himself was the only warning the aliens had. It was not enough.

H'Tash's left foreclaws tore the alien standing in the hatch almost in two. Its weapon clattered, unfired, to the hard packed game trail. H'Tash swerved and his center and right paws plucked the second alien, like a ripe fruit, from its seat in front of rows of dimly flickering lights. H'Tash's fangs clashed once and that alien's head disappeared into the storage pouch in H'Tash's throat. Without pausing, H'Tash pivoted and hurtled back out of the opening, landing squarely on the back of the last hunter, who, after his initial terror-caused paralysis, was attempting to flee. The alien had time for one horrified squeak before his head joined the pilot's.

H'Tash stripped the bodies then carried them to a cave-riddled cliff a kilometer away. The aliens were small; he made it in two trips. The only piece of alien equipment he took with him was the thing that killed. It appeared to be relatively simple. Perhaps, H'Tash thought, he might discover how it worked.

Briefly, he returned to the floater to study the flashing lights and absorb the odd sounds and smells with nervous fascination. These were tools beyond his comprehension or understanding. A rasping saw of sound from among the lights, a voice, startled H'Tash and sent him snaking from the floater in a hurried retreat.

The hunter who lives long is the cau-

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tious hunter, the one who never forgets the number or strengths of his prey. H'Tash carried the bodies over fifteen kilometers to another layup. There he rested and began to assuage the hunger of both his body and mind—the mind hunger most of all. The nocturnal hunters, he could already sense, were much more like the creatures he was familiar with—not exactly, the knowledge was blurry and chaotic. In addition it was strange and often incomprehensible, but it was there.

Three hours later, Jorge's call woke Fass'n from an uneasy sleep. "The collecting party's not answering, Fass'n. I've been calling them for the last fifteen minutes and haven't had a peep out of them."

Fass'n answered the announcement with a stream of profanity in his own language that Jorge was just as glad he didn't understand. "Wake the rest of the crew, then warm up the other floater, we're going to have to go after them. You do have a fix on them, don't you?"

Jorge confirmed that he had a solid fix on the otherwise silent floater, sixty-three klicks to the south east.

"Good. Then—no. Cancel that. We're going to lift ship. If that collecting party is in real trouble, the more firepower we can bring to bear, the better."

"Yes, sir!" Jorge agreed. The enthusiasm in his voice was anything but faked; if they lifted ship once, then maybe, just maybe, they'd lift all the way and get the hell off this planet.

Thirty minutes later they'd lifted, reached the target area and begun their descent, landing lights ablaze, to the

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silent floater. Ten minutes after that they almost wished they hadn't. The recovery was a grim and silent business.

The floater sat in the transport bay of the ship, port open, the recovered equipment harnesses, including Lyssthk's, laying beside its open hatch. "My God!" Jorge gasped, his eyes flicking over the spatters and runnels and pools of blood coating the inside of the floater's cockpit and storage bay. "What in hell could have done this?"

"Carelessness? Inattention?" Fass'n replied hoarsely.

"And a well-laid trap," Jorge added, frozen certainty creating spikes of ice on the edges of his words.

"Trap?" asked Fass'n.

"Trap," Jorge assured him, and the image of cold jade eyes blazed in his mind: eyes filled with intelligence, staring at him across a clearing. "Do you think we found Lyssthk's harness jammed under that rock by accident? One man out, two men in. The one outside sees the harness, points, and it's all over but the belching. As to who . . . same kind of animal—no. No *animal* sets that kind of trap. It was the same kind of *being* as the one that took out Trog and Harris and Dr. Damion."

Fass'n looked long at the paw prints in the smeared blood on the cockpit flooring. "Are you saying that those clawed predators are sentient?"

"Yes," Jorge confirmed. "And why not? I can think of a dozen races that don't have hands but have developed some pretty sophisticated societies. Most nontech, I admit, but the Hoosh and Feydn even managed to attain star travel without developing more in the way of biological manipulation than a damn smart brain. They literally built their entire technologies with their teeth."

"But they're marine forms," Fass'n protested. "They were peaceful vegetarians, not hunters."

Jorge gave him a disgusted look. "So what? Sentience develops for no common reason anyone's ever found. Who knows? Maybe there *is* a God who points a whatever and says 'you're sentient; you're a dumb animal'." Jorge paused and jerked an accusing thumb at the floater. "That is the work of a very sentient creature."

Fass'n shivered. "Eighty years an animal collector and I get this. Sentience? In a pure predator? I don't know, Jorge."

"Well, I do," Jorge said, his voice verging on a snarl H'Tash would have been proud of. "I know! I went head to head with one of them. Remember? I looked in those eyes. That beast was sentient!"

Fass'n shook his head. "Maybe. Something certainly set that harness as a trap. I just don't know for sure what—the beast or something using it. What I *do* know is that we are getting off this planet—now." He ignored Jorge's ill-concealed sigh of relief. "And we are going to turn this matter over to the Federation departments that are qualified to handle emerging sentient races. If you're right about those beasts, the discovery fee for a new sentient race should offset the nonperformance penalties."

The disgust Jorge felt for the mention of financial concerns when they'd just lost half their crew must have been plain on his face.

Fass'n's features writhed in response.

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"Don't look at me like that, Jorge. *Nothing's* going to offset our personnel loss." Fass'n's face twisted again, reflecting the instinctive revulsion he felt for a sentient race which used another for food. "And! We are going to file an immediate proscription recommendation on this whole damn system." He looked bitterly at the small group remaining. "Jorge, up ship as soon as possible, if you would."

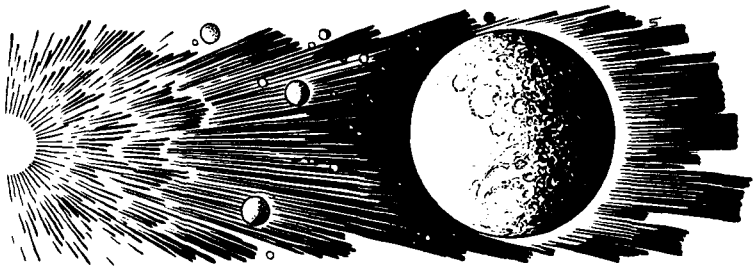
"Like yesterday," Jorge muttered as he headed for the control room. "Thank the Way those critters don't have hands. The whole Federation could have a problem if they develeoped a technology to match their temperaments and appetites."

The reports and recommendations of the collectors were filed and the bureaucratic gears began to grind—ever so slowly. The reports were considered, investigated, refiled, reconsidered and reinvestigated, and long scheduled colony ships were launched.

Like the Federation bureaucrats, H'Tash dozed and dreamed, but more effectively. He had watched the aliens at work. *Yes,* he thought, *a manipulating hand would be a great advantage.* His mind wandered over the possibilities: *not the outer hunting claws, definitely not. How would one catch and kill food without them? But the central paw . . . shorten the claws, extend the joints, reversing one, possibly two digits, to give opposition. Combine that with a few minor modifications of the already prehensile tails . . .* Deep within H'Tash's body, tiny organisms, the same organisms who had made him immune to the tranquilizing agents of the collectors began to make other, more gradual changes in his genetic code.

Nor was H'Tash the only thinker along those lines. Nor was his species the only sentient one on the planet. The seeds of a new and devastatingly unique civilization had been sown and were beginning to grow in very fertile ground.

For the present, H'Tash was unconcerned and unworried. He wiggled into a more comfortable position on his back, legs waving casually in the warm air. Someday, he thought, someday the strange beings from the stars would return. Someday they would be back in all their tasty variety. ■



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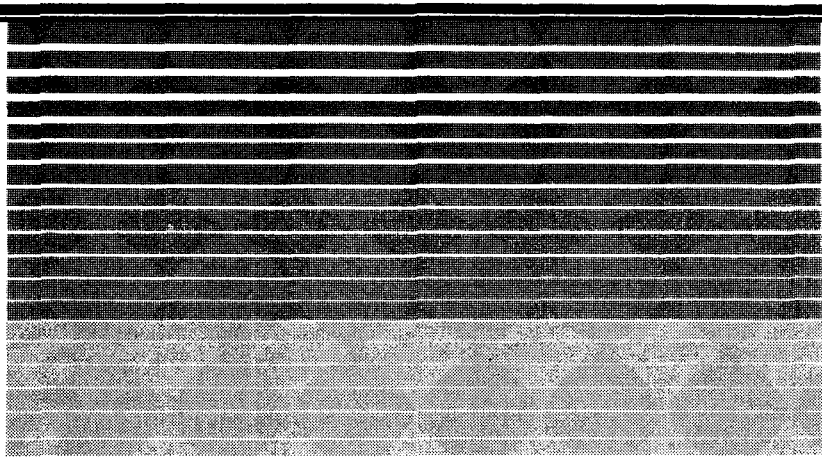

Michael F. Flynn

AN INTRODUCTION TO PSYCHOHISTORY

Conclusion

PART II: THE BIOLOGY OF HISTORY

"You do not know, my dear boy, with what little reason the world is governed."

(Count Axel Oxenstierna)

Biology and culture are closely related. If nothing else, a human society is a biological population, subject to various ecological laws. But there are also structural parallels, or analogies. Adam Smith and Karl Marx relied heavily on biological analogies in developing their economic theories; and Charles

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Darwin explicitly borrowed the notion of evolution through natural selection from Adam Smith.[12]

History itself is analogous to biological morphogenesis. Both deal with the evolution of structure within a system. Genetically identical cells differentiate into nerve cells, muscle cells, etc., becoming complex organisms with many specialized organs. Similarly, hunter/gatherers differentiated into priests, kings, metal workers, etc., developing complex states with many specialized institutions. Are the mechanisms in both cases analogous?

In his book, *Living Systems*, biologist James Miller compared cells, organs, organisms, organizations, and nations; and concluded that all "living systems" share a common structure (cf. Robert A. Freitas, "A General Theory of Living Systems," *Analog*, March, 1980). All consist of nineteen vital subsystems that process information and/or matter-energy. For example, a cell's membrane and a nation's border/custom guards are *boundary* subsystems, and function in analogous ways by regulating the flow of both information and matter-energy between the system and its environment. If any of Miller's nineteen subsystems fail, the system "dies."

Dr. Miller's model provides a framework for applying knowledge about one type of living system to other types. But . . . A word of caution! Societies are no more "super organisms" than organisms are "super cells!" They are distinctly different sorts of systems that, nonetheless, possess significant structural parallels.[13]

All living systems process information. Biological systems use DNA; while cultural systems use Language. Both forms of information processing are called "intercourse." The information content of a system is called its *complexity*. Non-living systems become progressively less complex (entropy); but living systems can absorb information and matter/energy from their environment and become *more* complex (evolution).[14]

We can estimate the complexity of a society by the number of its functional specializations. In a chiefdom, for example, everyone is a farmer, even the Chief and the Smith; but in a city-state, there are full-time administrators and artisans. Fifty years ago, writes David Warsh, " 'specialist' meant a cavalry officer or an organic chemist." Today we have astronauts, media advisors, arbitrageurs, test engineers, science fiction writers and a host of other special-

[12]Which is why the left resists Darwinism so bitterly (putting them in bed with right wing religious fundamentalists!) A reviewer in the *New York Times Book Review* wrote recently that "evolutionism [sic] was the ideological reflection of economic exploitation and class conflict in an age of rapid capitalist economic development and imperial expansion."

[13]John W. Campbell always contended that analogy could be as rigorous as deduction. Hence the name of this magazine. Does anyone remember the little symbol ⇝ ?

[14]The dividing line is fuzzy. Biologists, for example, do not regard viruses as living. There is an entire class of "self-organizing" systems that bridge the transition between the living and non-living.

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ties. Warsh makes a persuasive case that general rises in the price level are the result of social complexification, as the costs of innovations "cascade" throughout the economic "price web." A stay in the hospital, he writes, costs more today because it is no longer the same as a stay in the hospital fifty years ago. Thus periods of hyperinflation generally follow periods of intense technological innovation.

Systems become more complex through the dual processes of specialization of function and centralization of controls. Archeologist Kent Flannery has explored these processes and studied the mechanisms by which they come about. As societies become more complex, they become larger and more durable. The sage advice of the Old Man of a hunting band might influence a score of people around the campfire. But the Code of Khammurapi—written, promulgated, and backed by a civilized State's monopoly on force—influenced hundreds of thousands for centuries throughout the ancient Near East. Parts of the Code survive in the Bible (eg., in Psalm 22(23)), and continue to influence millions to this day!

However, when carried too far, complexity becomes *hypertrophy*. By centralizing and specializing, the society has become progressively better suited to its local habitat. Then—just as with biological species—so long as the habitat stays the same, evolution "stops" (reaches equilibrium). When the (physical or cultural) environment changes, the society may be unable to re-adapt quickly enough. Institutions/organs that have served it well in times past cannot be instantly abandoned! The result is often collapse: mass extinctions or Dark Ages.

History consists of both convergent and divergent evolution. Sometimes, different societies behave the same way—often at the same time. Examples include the worldwide nature of the population explosion, which began in the 16th century in regions very different in their sanitation, medicine, and religious beliefs; and the near-simultaneous invention of agriculture in habitats containing very different plants and animals. The causes in these instances must be global or "common causes."

In other cases, societies pursue different paths. When the first states emerged in regions like Egypt, Mesopotamia, and North India, they were centralized despotisms. In other regions, like Europe, West Africa, or South India, they were "feudal republics." Rulers like Louis XIV or 'Othman dan Fodio never wielded a fraction of the power of a Cheops or a Khammurapi. Does this tell us anything of the kind of state that would evolve in orbital colonies?[15]

Sometimes, societies converge *and* diverge. China and the Mediterranean had remarkably parallel histories, with the analogous events running about two centuries "late" in Greece and Rome. But their later histories diverged just as remarkably, as a comparison of the an-

[15]Hint: Despotism was possible in irrigation-dependent societies because the controls were centralized. The ruler could "turn off the tap" on his enemies. Rulers in rain-watered lands could not.

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alogs in Figure 15 will show.

It would be simple to create a theory accounting for complete divergence. Random Chance will do! Complete convergence would also be easy to explain: by Instinctive Behavior, for example.

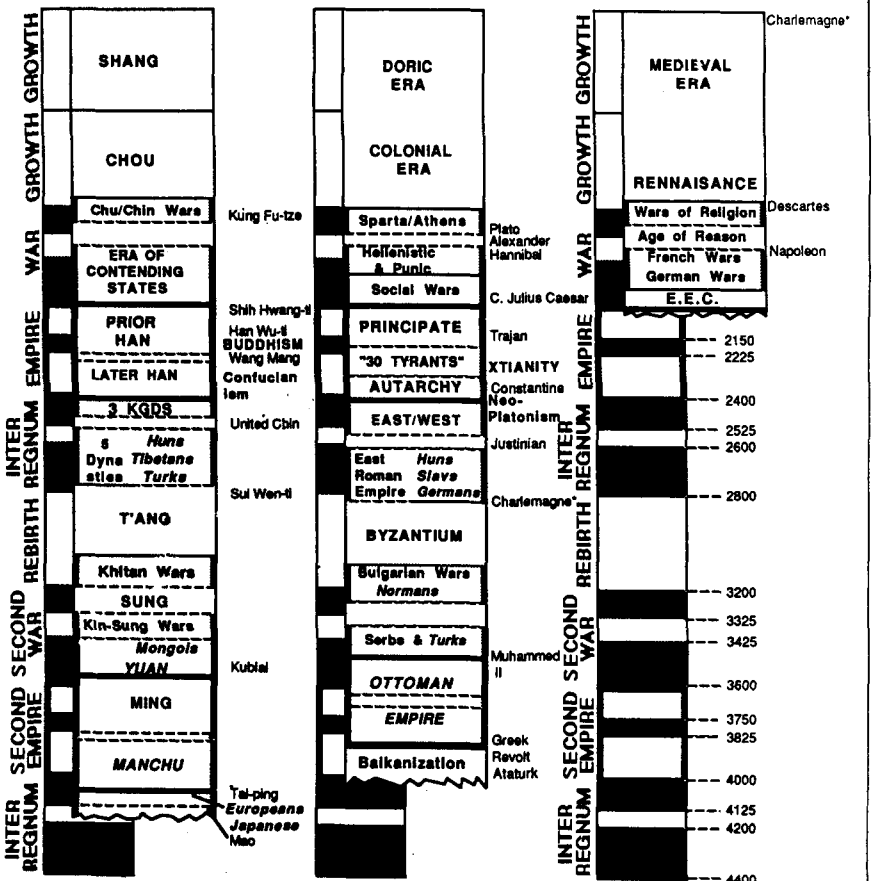

Figure 15: A schematic representation of Chinese and Mediterranean history. Such a scheme obscures the real and important differences between them, but also highlights some important similarities. For example, the "Second Empire" in both cases was foreign (Mongol and Manchu vs. Turkish); but the Phanariot Greeks never played the role of the Ming. Both the T'ang and Byzantine Empires had to "share their space" with rival states (such as Nan-chao or Bulgaria). Charlemagne's failure to imitate Sui wen-ti kicked Europe onto a different track, independent of the Mediterranean.

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But the psychohistorian's job is tougher. Can we explain *both* convergent and divergent behavior?

"A proper theory must be predictive and at least potentially quantitative."
Auguste Comte

Some theories of culture, like Sociobiology, try to explain social behavior genetically (cf. Thomas A. Easton, "Altruism, Evolution, and Society." *Analog*, Oct 1976 for an overview of sociobiology). However, societies can change radically, even within a single biological generation: Witness the modernization of Japan by the Meiji reformers or the adoption of horse nomadry by the Plains Indians.[16] Cultural traits like the light bulb, Marxism, or the theory of relativity spread through society regardless of whether their inventors and their close kin produced offspring. This does not mean that genetics plays *no* role in culture. Genetic theories can describe the human "design envelope" within which change is possible, but they cannot explain variation *within* the envelope. For that, we must look elsewhere.

Let's look more closely at the information-processing side of culture.

History happens when people alter their behavior. People settle down and farm. Or abandon their cities. Or adopt a new religion. Physicians begin to prescribe a new drug; farmers, to plant a new hybrid rice. People learn to use postage stamps; or to hijack airplanes. Sometimes these behaviors "catch on" and sometimes they don't. Why?[17]

Richard Dawkin's concept of the *meme* may clarify the process. Memes are the cultural analog of genes. They are "elementary ideas that replicate in human minds." Facts, proverbs, slogans, etc. are examples of memes. This article is a meme complex. Memes "prosper and die in brain tissue in accordance with their usefulness and appeal. . . ." They "propagate from brain to brain by word of mouth, by demonstration, or by radio-waves" and are acquired by imitation (mimesis). They induce learned behavior just as genes induce instinctive behavior.

Sociologist Robert Hamblin and his associates have studied hundreds of cases of cultural change, ranging from the amount of U.S. railroad traffic to Latin American revolutions. Plotting the behaviors over time, they discovered that the adoption and usage of innovations follow mathematical laws analogous to those of epidemics (Figure 16).

Let **p** be the proportion of a society "infected" with a particular meme; and suppose that members of the society are in continual interaction through shared communication channels. "Members" can be people, organizations (such as industrial firms), or nation-states. (Examples are: the diffusion of the "paid vacation meme" through industry; of the "compulsory education meme" through the states of the Union; of the "postage stamp meme" through West-

[16]Surely you didn't think that rapid change occurred only in advanced, industrialized societies!

[17]Twenty-seven years elapsed between the zipper's invention and its use in men's trousers. Why didn't it catch on sooner? Or perhaps it did "catch on" and that was the problem!

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ern nations.) As "non-doers" encounter "doers," there is a probability, **k**, that the non-doer will "catch" the behavior. In other words, that:

$$dp/dt = kp(1-p)$$

which integrates to a logistic curve similar to those describing such contagious diseases as measles. Available data on cultural diffusion indicates that the logistic curve provides a good fit in most cases.

Behaviors can also spread through

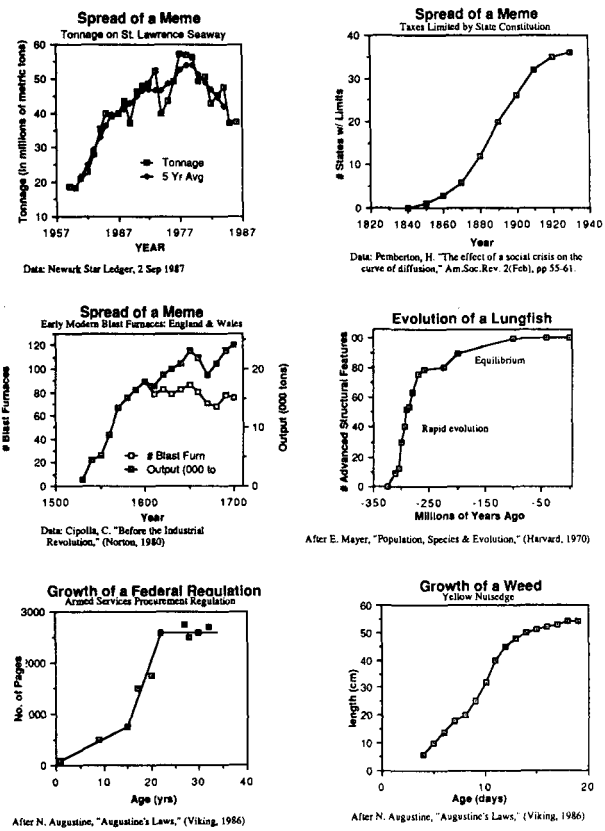
Spread of a Meme
Tonnage on St. Lawrence Seaway
Tonnage (in millions of metric tons)
Tonnage
5 Yr Avg
YEAR
Data: Newark Star Ledger, 2 Sep 1987
Spread of a Meme
Taxes Limited by State Constitution
States w/ Limits
Year
Data: Pemberton, H. "The effect of a social crisis on the curve of diffusion," Am.Soc.Rev. 2(Feb), pp 55-61.
Spread of a Meme
Early Modern Blast Furnaces: England & Wales
Blast Furnaces
Output (000 tons)
Blast Furn
Output (000 to
Year
Data: Cipolla, C. "Before the Industrial Revolution," (Norton, 1980)
Evolution of a Lungfish
Advanced Structural Features
Equilibrium
Rapid evolution
Millions of Years Ago
After E. Mayer, "Population, Species & Evolution," (Harvard, 1970)
Growth of a Federal Regulation
Armed Services Procurement Regulation
No. of Pages
Age (yrs)
After N. Augustine, "Augustine's Laws," (Viking, 1986)
Growth of a Weed
Yellow Nutsedge
length (cm)
Age (days)
After N. Augustine, "Augustine's Laws," (Viking, 1986)

Figure 16: "The logistic curve fits a great many growth situations for living systems. In biology: the growth of an organism; the growth of a population; the evolution of a species. In culture: the frequency of a behavior ("learning curve"); the spread of a behavior in a population; use intensification; evolution of an idea (e.g. accumulated number of modifying patents on a basic invention). A few examples are shown in the Figure. For further examples, see Hamblin, et al. and Dewey and Dakin in the Memeography.

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contact with a central information source (eg. TV, *Analog*, professional journals, government news releases, etc.) This is analogous to environmental diseases, like cholera. In such cases, a decaying exponential curve provides a better fit.

(Interestingly, the same curves that fit the number of correct responses in task-learning, or the number of pages in the growth of a federal regulation, also fit the percentage of "modern" features in fossilized species. In a sense, a species "learns" to be modern by "imitating" successful behavior! Is punctuated equilibrium a consequence of learning theory?)

The notion that behaviors are like epidemics (and ideas, like viruses) is an intriguing one (cf. Keith Henson, "Memetics and the Modular Mind," *Analog*, Aug. 1987). But not a new one. Lewis Richardson, in his "Mathematics of War and Foreign Politics," wrote in 1946 that "Eagerness for war can be regarded . . . as a mental disease infected into those in a susceptible mood by those who already have the disease. . . ." He even developed an equation similar to Hamblin's. We might say that, while memes are "like" genes as far as the total society is concerned, they are "like" viruses from the individual's viewpoint. In light of Dr. Miller's Living Systems Theory, much of the mathematics of genetics and epidemics will eventually be adapted to the study of social change.

There is also a geographical, or spatial, element to the spread of memes. We've assumed that the members of the society "are in continual interaction through shared communication channels." Prior to the invention of telegraphy, that meant face-to-face contact. Memes circulated with the traveling people, especially with those engaged in trade. Rashevsky developed a mathematical model for this process. He expressed the number of travelers as a function of (among other factors) w^2, where w is the product of the speed and carrying capacity of transport technology; i.e., how much can be moved how fast. (Something like a cultural momentum.) Since ships could carry more goods faster than carts, regions with significant connectivity to rivers and coastlines would have a higher w^2 than other regions.

One way to measure this effect is through the *specific shoreline*. This is the ratio of the total length of coastline + river to the total land area. Other factors being equal (which they never are!), regions with high specific shoreline, like Western Europe and the Mediterranean, should experience higher rates of cultural development, once they have achieved a sufficient population density. (A critical mass is needed to sustain a chain reaction of ideas.)[18]

Most communication consists of people repeating familiar memes to one another, and teaching them to children and new recruits. This is how a society perpetuates its "pattern of culture." Sometimes, old memes are strung together in a novel way. This is called "originality." On rare occasions, a genuinely new meme appears: either a sponta-

[18]So, maybe memes are a little like neutrons, too?

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neous mutation or an alien meme from another society. When it does, the society resists it savagely. Management consultant Joseph Juran has written regarding the Corpernican meme that "it was *easier* to burn the astronomers" than to accept the new idea.

What determines whether a meme will be adopted or rejected by the society's "immune system?" That brings us to the *psycho*-part of psychohistory.

"Why should we plant when there are so many mongongo nuts in the world?"
(Kalihari Bushsman to a western anthropologist)

Individuals learn through trial and error, but in social groups, we also learn through observing and imitating the successful behavior of others. Monkey see, monkey do. (This may be part of our sociobiological envelope.) The more "successful" the behavior appears to us, the more likely we are to imitate it.

Every behavior has a cost: the time and energy needed to perform it. Every behavior also provokes responses from the physical and social environment which reinforces the behavior. Farming, for example, produces food, which positively reinforces the act of farming. Gravity, on the other hand, negatively reinforces the act of jumping off tall buildings. *The probability of imitating a behavior is directly proportional to the margin between effort and reinforcement* (Figure 17). More people imitate

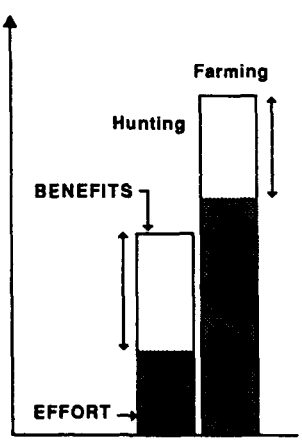

Figure 17: Humans were hunters for thousands of years longer than we have been farmers. The diagram shows why. Column height represents the return in biopsychological benefits; the shaded part, the effort to obtain them; and the white area, the biopsychological "profit." Hunting provides adequate calories with relatively little effort. Farming provides more calories, but the effort is also much greater, making the "profit margin" less attractive.

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It turns out that everyone was right about Connie Willis's ability to write a great first novel. Though one was hardly taking one of the Major Risks of Our Time by suggesting that she would do so. After all, she had already proven with her short fiction that she was among the most intelligent and thoughtful writers our field had seen in years. Her story collection, **Fire Watch**, was even listed as one of the *New York Times* notable books of 1985. So even though some writers have a difficult time making the transition from short fiction to novels, no one doubted for a second that Connie would do so gracefully and brilliantly (at least no one told *us* so).

Well, as we said, everyone was right. This breathtaking novel of a young woman whose dreams take her on an emotional odyssey through the heartland of the Civil War was raved about from coast to coast when we published it in hardcover. The *San Francisco Chronicle* used words like "tantalizing" and "fascinating" and "impeccable." The *Washington Post Book World* called it "a novel of classical proportions and virtues." *The New York Times Book Review* said it was "a love story on more than one level, and Ms. Willis does justice to them all. It was only toward the end of the book that I realized how much tension had been generated, how engrossed I was in the characters, how much I cared about their fates." And the *Denver Post* commented that "the revelation at the end is the most poignant moment in a book crammed with poignancy."

Connie's fellow writers were quick to lavish praise upon her as well. Richard Adams called **Lincoln's Dreams** "moving and beautiful...a most original and fascinating novel." Cecelia Holland called it "a powerful reading experience. It moved me beyond my ability to say." "Suspenseful, thought-provoking, and poignant," were the words Michael Bishop used to describe it. And Harlan Ellison suggested that "to enjoy Ms. Willis's work is only common sense; to miss **Lincoln's Dreams** is to risk the loss of your immortal soul."

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farmers than imitate jumpers.[19]

Reinforcement comes in many forms. Some reinforcers are natural, part of our sociobiological design envelope. We are born wanting them. Other reinforcers, like money, are conditioned. We learn to want these. Harris proposed a minimal list of three natural reinforcers, namely:

1) People need to eat and will generally opt for diets that provide more rather than fewer nutrients.

2) People are highly sexed and find reinforcing pleasure in heterosexual intercourse.

3) People need love and affection; and, other things being equal, they will act to increase the love and affection which others give them.

Harris calls these "biopsychological benefits." In addition, he proposes a fourth benefit, one which affects the "cost" of the behavior:

4) Law of Least Effort: People cannot be totally inactive, but when confronted with a given task, they prefer to carry it out by expending less rather than more energy.

Harris suggests that cultural institutions originate in people's attempts to meet these needs. While other needs may also serve as reinforcers, they are ultimately dependent upon these basic ones. Empirical studies of worker motivation seem to bear this out. Management theorist Abraham Maslow found that workers were motivated by a "hierarchy of needs," ranging from "survival needs" through "self-actualization." Reinforcement of a higher level need, he discovered, failed to motivate a worker unless the lower level needs were already satisfied. "You can't debate politics on an empty stomach."

Another word of caution! Remember that we are speaking statistically. The fact that individuals *in general* pursue these biopsychological benefits does not mean: a) that *everyone* pursues them; or b) that anyone will catch them! Systems are complex, and the pursuit of more benefits frequently results in less; especially when the immediate results of a behavior appear beneficial, but the long-term and spin-off results are not. Hunting provides calories for primitive societies; but the continued intensification of hunting will drive the game away, resulting in fewer calories. Like happiness, it is the pursuit, not the success, that is guaranteed.

Spin-off behavior can be quite unexpected. Effects may lag many years behind the cause. No cause has a single effect; no effect, a single cause. You can never do just one thing. Inflation is a spin-off of defense spending; but also of technological innovation. The system has a "meta-life" of its own, and has "meta-purposes" independent of anyone's intentions. Environmentalism has strengthened the large oligopolies; surely not what the small-is-beautiful people intended!

"It may plausibly be argued that the shape of a culture—its mores, evalua-

[19]Although, with the way the costs of farming have been increasing, some people see little difference between starting a farm and jumping off the World Trade Center.

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tions, family organization, eating habits, living patterns, pedagogical methods, forms of government, and so forth—arise from the economic necessities of its technology.''

Robert A. Heinlein (Waldo)

''The mode of production in material life determines the general character of the social, political, and spiritual processes of life.''

Karl Marx (A Contribution to the Critique of Political Economy)

The *behavioral infrastructure* of a society consists of the modes of production and the modes of reproduction. The modes of production, according to Harris, are ''the technology and practices employed for expanding or limiting basic subsistence production, especially the production of food and other forms of energy, given the restrictions and opportunities provided by a specific technology interacting with a specific habitat.'' The modes of reproduction are ''the technology and practices employed for expanding, limiting, and maintaining population size.'' These include such things as rites of passage, marriage rules, contraception, abortion and infanticide.

Principle of Infrastructural Determnism: The behavioral modes of production and reproduction statistically determine the behavioral domestic and political economy, which in turn statistically determine the mythology and mental superstructure of the society.

This principle (which I have paraphrased) is the basis of Harris's theory of *Cultural Materialism*. It is the result of our inability to change two ecological laws: 1) We must use energy to obtain energy and 2) Our ability to produce children exceeds our ability to obtain energy for them.

The infrastructure is ''the interface between culture and nature.'' It is where the material restraints of physics and biology interact with the cultural practices aimed at overcoming them. The roots of culture lie here, not in the myths and beliefs of the society. As Harris puts it: ''Nature is indifferent to whether God is a loving father or a bloodthirsty cannibal. But nature is not indifferent to whether the fallow period in a swidden field is one year or ten.'' Put another way, a society that farms with hoes (slash-and-burn, or ''swidden'' agriculture) cannot have the same institutions as a society that farms with plows.

Harris has written several books on the infrastructural origins of seemingly irrational customs. Consider, for example, the Middle Eastern pig taboo. Pig bones have been found in early, Neolithic sites; but later societies, such as the Egyptians, Babylonians, Hebrews, and Arabs (even *before* Islam!), abominated the pig (eg. Lev. 11:7-8; or Koran 2, 168). The reason was not mysticism, but thermodynamics! Unlike other domesticates, pigs cannot be ridden, milked, or hitched to a plow. They are useless, save as meat animals and scavengers. Furthermore, they fatten best on foods that humans can eat directly: nuts and tubers. As agriculture spread, the Near East became deforested. Pigs can't sweat, and to cool off in arid, treeless lands, they must wallow in precious waterholes and oases. So,

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except in forested areas (cf. Matt. 8: 28-33), swineherding societies would be at a selective disadvantage. A meme such as "God forbids pork" would be positively reinforced by the physics of deforestation. However, it was the infrastructural conditions that led to the divine injunction, not the other way around.

When infrastructural conditions aren't right, a meme won't spread, no matter how useful it appears to outsiders. Some Amerind tribes knew about the wheel. They used them on toys. But, without traction animals, building carts provided too little reinforcement.[20] The Kalihari bushman quoted above knew *how* to farm; he just saw no reason why he should bother. Hiero's steam turbine, DaVinci's helicopter, Coanda's jet airplane (see *Analog*, July, 1984), Lillienfield's transistor (see *Analog*, March, 1965). All failed to "catch on." Why should we transistorize, people reasoned, when there are so many vacuum tubes in the world?

But memes can—in Margaret Silbar's phrase—be "born again." Newton, Leibnitz, and the calculus. Darwin, Wallace, and natural selection. Henry, Edison, Bell, Gray, and the telephone. When conditions are right, the right thoughts will be thought—often by several people simultaneously. "Great ideas are in the air," says Stephen Jay Gould, "and several scholars simultaneously wave their nets." That's why God, in His infinite wisdom, created patent attorneys. (Alexander Bell and Elisha Gray applied for telephone patents on the same day!) "When it's time to railroad," John Campbell used to say, "people start railroading."

These considerations lead us to:

Basic Axiom of Cultural Evolution: Cultures evolve through natural selection acting on memes to maximize individuals' biopsychological benefits.

"You knew your place if you belonged to a caste. Perhaps more importantly, if you belonged to a caste you knew there was *a place for you."*

(Paul Colinvaux)

Now let's turn to the energy-processing side of society. A human society is a biological population. Like any such population, our ability to produce children exceeds our ability to obtain energy for them. The resulting compression of reproduction on resources is the driving force of cultural evolution, just as it is of biological evolution. However, there are a few twists to this analogy.

A society is more nearly like a mosaic of species than it is like a single species. Ecologist Paul Colinvaux sees the social class as the cultural analog of the species. A species is defined by its role in the ecosystem; that is, by its "lifestyle": What to eat (and be eaten by); what sort of nests to build and where; how to find mates; etc. We call this its *niche*. A broad niche (eg. bears) requires many resources; a narrow niche (eg. squirrels) requires fewer.[21]

[20] In effect, you *can't* put the cart before the horse.

[21] Behavioral barriers are as important as fertility barriers. The two interfertile populations of Atlantic bluefin tuna are considered different species because they, quite literally, swim in different circles, reaching the mid-Atlantic spawning grounds at different times.

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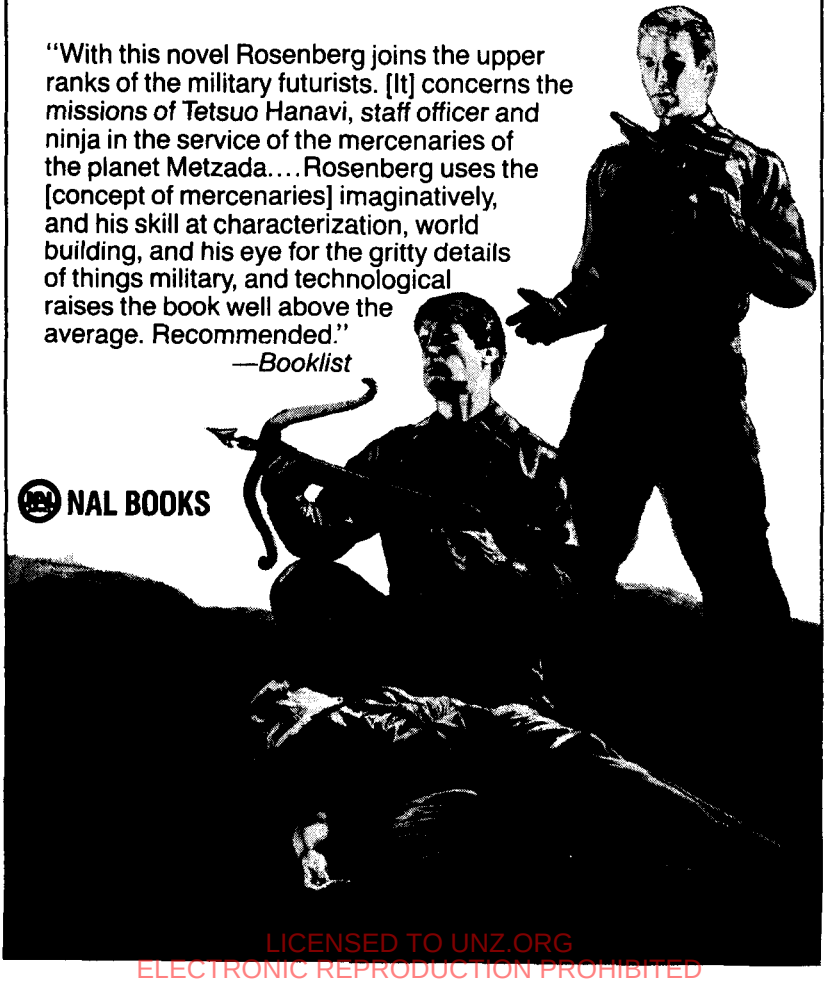

NAL BOOKS

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Similarly, a social class is characterized by particular jobs, clothing styles, housing, neighborhoods; and usually marries within its class. In caste societies, like Hindu India, Victorian England, or the late Roman Empire, the marriage, residency, sumptuary, and occupational rules may be spelled out explicitly; but they are implicit in all human societies. We can even extend the ecological analogy to predator-prey relationships, if we substitute a "price-web" of exchanges for a "food-web" of calories. (It doesn't matter whether or not the society uses metal tokens to keep track of the exchanges.) Thus, barbers are predators and men with hair, their natural prey.[22]

The fundamental law of animal ecology is that niche sets numbers. It is the niche size relative to the resource base that determines the population size, not the reproductive effort. Thus, the number of lawyers (to take one example) is set by the size of the lawyer niche, not by the reproductive efforts of the law schools. The same resource base will support more narrow niches than broad ones; which is why squirrels outnumber bears, and sales clerks outnumber lawyers.[23]

There is one crucial distinction between biological and cultural species. A cultural species is a "fuzzy" set. Surplus squirrels must die, but surplus lawyers can change niches and find honest work. *The ability to change niches (and to create additional niche space through technology) is why humans have histories and squirrels don't.*

Thus, a society is a mosaic of fuzzy-edged species, each one having its own lifestyle and resource needs. And each one, consequently, having its own intrinsic growth rate. The concept of reproductive pressure only makes sense in this context. Pressure is experienced independently by each class-species, not by the society as a whole.

Each class-species tries to maximize reproductive success by raising the largest affordable number of children. If you have either too few or too many offspring, you risk losing your genes. Family size (actually a stastical distribution of family sizes) is a function of the difference between the biopsychological resources needed by the parents to maintain their own lifestyle and the biopsychological investment needed to raise children in the same niche:

$$N \propto (R - P)/C$$

Here, **N** is the average number of children; **R** is the expected available resources; **P** is the parents' resource needs; and **C** is the unit cost of raising a child.

Thus poor families tend to be larger than wealthy families; and rural families, larger than urban ones. That's why the U.S. birthrate has declined steadily as the country became more urbanized. The cost of raising a child in a narrow niche is much less than in a broad one. No one *expects* to go to Harvard! Fur-

[22]A predator usually consumes only 10% of its prey's calories; but the prey is 100% dead. In cultural predation, where money or goods are used to represent the calories, the IRS, merchant, labor union, or literary agent take their cut, but the prey survives, though in more reduced circumstances.

[23]I know it doesn't *seem* that way....

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thermore, children in narrow niches often begin contributing to family resources at an early age: by doing chores around the farm, by begging in the streets, or (before child labor laws) by working in mines or factories. In contrast, broad niche children are expensive to raise, and rarely if ever repay their parents' investments. In many so-called "yuppie" niches, children are so costly relative to the parents' own lifestyle needs that the parents opt out of childrearing altogether.

In short, the poor have larger families because they can "afford" them.[24] **R** may be low; but so are **P** and **C.** Contrary to popular belief, it is the well-to-do, not the poor, who feel the reproductive pressure most keenly. As Colinvaux remarks, there is always room for another poor devil; but not for another successful merchant, professor, priest, or senior official. That's why Zero Population Growth was discovered in the white suburbs rather than in the black ghettos; and why the Limits to Growth were first noticed by the wealthy Club of Rome.

Population growth has been regulated in two ways. *Restriction of Breeding Privileges* includes such customs as dowries, rites of passage, arranged marriages, homosexuality, celibate priesthoods, state-required licenses, high status for virgins, monogamy, the Pill, etc. As an example: Chaka Zulu forbade his warriors from marrying until they were thirty years old.

[24]Although the Right wing prefers to blame the weak moral fiber of the "lower classes."

The second means of regulation is *Culling the Surplus* through abortion and infanticide, especially of young girls.[25] The ancient Greeks left their surplus babies on the *polis* midden heap; modern Americans, in the clinic Dumpster. During the Victorian Age, East End slum babies were frequently found in trash cans. Hansel and Gretel's father took them into the woods and abandoned them. "Foundling" sounds better, but it's part of the same behavior complex. Figures from 17th century Milan, for instance, show that 10% of the babies were being abandoned on the steps of churches and orphanages. (And the orphanages weren't called "angel makers" for nothing.)

These painful measures produce a strong drive to avoid them by producing more resources. Rulers work hard to raise the wealth of their subjects, to bring more and more people out of poverty. The easiest way is to *intensify the technology of resource production.* Send out more hunters; sow more acres; drill more oil wells. For a short while, resource production may even surge ahead of population growth. But intensification eventually flattens out. Habitat damage reduces the biopsychological benefits of the technology at the same time that the marginal biopsychological costs are increasing. Intensified hunting drives the game away, so hunters have

[25]It sounds sexist; but infanticide and abortion are only effective in population control when females are the preferred victims! Males are largely irrelevant to population growth; but, in primitive societies, they are necessary for village defense. Only technological societies are free of the need to raise strong, aggressive males and can therefore *afford* women's lib.

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to hunt longer and wander farther to bring home fewer calories. Eventually, the reduced margin demotivates the old technological behavior and a *breakthrough* to a new technology occurs (Figure 18). The new technology allows greater numbers to live comfortably in a habitat that previously felt crowded. Swidden farming will support ten to a hundred times the population as hunting/gathering. Even if they *tried* to coexist, farmers would eventually swamp hunters in a sea of progeny. That's how iron-using Bantu farmers seized southern Africa from stone-using Bushmen hunters between the first and fifth centuries A.D.[26]

This relieves the pressure on resources. But, the relief is only temporary and a new cycle of compression will begin. The unchanged breeding strategy assures that numbers will continue to grow, and the increase in resources due to new technology will be consumed within a few short generations. The net result of more resources has always been more mouths to con-

[26]Surely you didn't think only Europeans took over other peoples' continents!

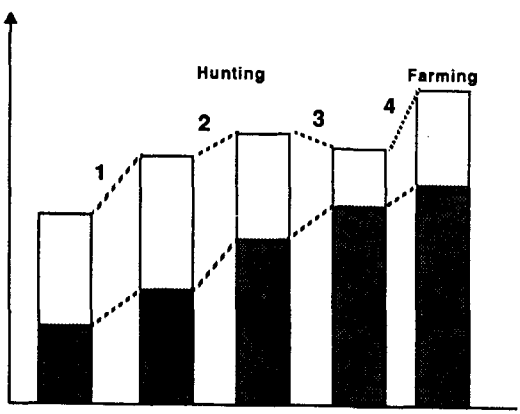

Figure 18: **A Schematic Representation of the Transition from Hunting to Farming:**
(1) Initially, intensification of hunting leads to more net calories.
(2) Continued intensification produces successively smaller marginal increases as the limits of the technology and habitat are reached;
(3) Finally, overhunting depletes the habitat. The "Pleistocene Megafauna" was exterminated and our ancestors turned to "broad spectrum" hunting (ie. they ate grubs and insects and rabbits because they had killed all the mammoths). This meant less food for more work;
(4) At this point, farming began to look attractive, despite its high labor costs and maldistribution of wealth.

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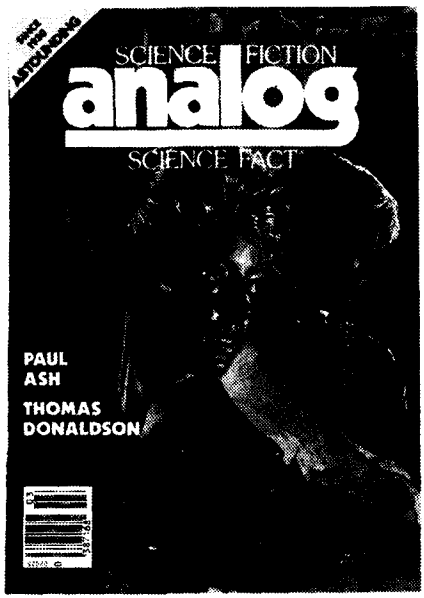

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sume them. "The poor," said Jesus of Nazareth, "you will always have with you." According to Colinvaux, ecology's first social law is, *"All poverty is caused by the continual growth of population."*

Colinvaux's theory predicts that:

- The middle and upper classes will feel the crowding first.
- Rulers initially sympathetic to the poor will become selfish and oppressive. (Environmentalism and Reaganomics have the same roots.)
- Social troubles will be episodic (as new niche space is first created, then filled) and will originate in the middle classes.[27]
- Methods of allocating people to narrow niches will evolve; eg. caste systems, market forces, government assignment.

"They shall beat their swords into plowshares and their spears into pruning hooks: Nation shall not raise the sword against another, neither shall they study war anymore."

(Isaiah 2, 4; Micah 4,3)

"Let all the soldiers report and march! Beat your plowshares into swords, and your pruning hooks into spears: Let the weak man say, 'I am a warrior!' "

(Joel 4, 10)

"To everything there is a season: and a time for every purpose under heaven. . . . A time of war and a time of peace."

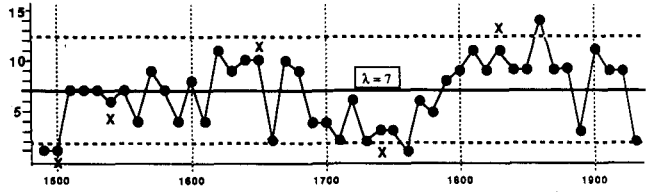
(Eccl. 3, 1-8)

State warfare is probably the most compelling aspect of history. It hangs over our lives like a threatening cloud. No one knows when the storm will strike; when some would-be Napoleon will spring forth. Like the lightning, it is unpredictable.

Or is it? What does the record say?

Eurasian nomads have erupted off the steppes regularly every 5 centuries (±1 century). Coincidence? A list of wars compiled by Richardson, plotted on a Shewhart chart (Figure 19a), hints at a 200 year cycle. A stastical analysis of wars conducted by Singer and Small also discovered a 25 year cycle in "na-

[27]Revolutionaries like Robespierre, John Adams, Nikolai Lenin, Ho Chih Minh, Sun Yat-sen, et. al. were all members of the upper or middle classes.



Source: L.F. Richardson, "The Statistics of Deadly Quarrels."

Figure 19a: Data on the number of wars starting in each decade shows a slow cycle winding its way around an average of seven wars. The X's indicate deviations from the average (or runs above/below the average) that are unlikely to be due to random causes. The dotted lines are the 95% probability limits for random fluctuations.

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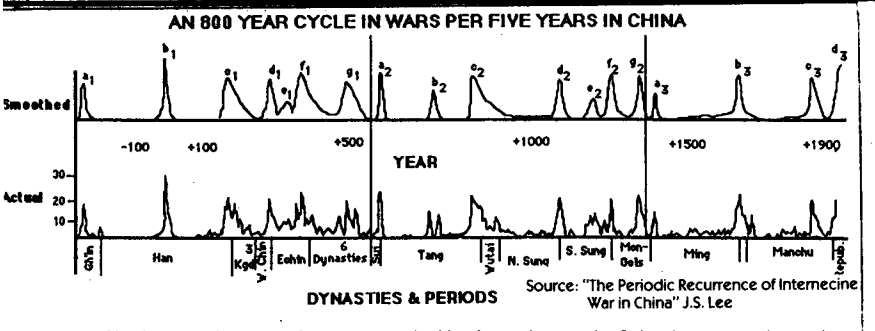

Figure 19b: By actual count of wars recorded in dynastic annals, China has gone through two and a half repetitions of an 800 year long cycle. This cycle consists of alternating 400 year long blocks of "war" and "peace" (relatively speaking). China entered her current "war and disunity" phase with the outbreak of the T'ai-p'ing Rebellion. It has continued through the eras of the warlords, foreign occupation, Civil War, Taiwanese secession, and Cultural Revolution. If the cycle is still in force, China will not be reunified until the mid-23rd century.

tion-months of war underway per year." Perhaps the most startling such analysis was one which J. S. Lee made of the wars among Chinese states recorded in dynastic annals. His chart reveals two-and-a-half repetitions of a pattern *800 years long!* (Figure 19b).

Such regularity argues against the "conqueror" theory of war. Even if wars are instigated by ambitious captains, we must still explain why the captains pop up at scheduled times! The ecological theory offers some plausible explanations.

"When you run out of niche space for the good life," writes Colinvaux, "you can always look for more elsewhere—through trade, colonies, and aggressive war."

Culturally speaking, you occupy a lot more space than your immediate surroundings. Your "space" includes *pro rata* shares of all the farmland, mines, parks, theatres, et. al. that are required to maintain you in your accustomed niche. That is why people can feel crowded even when there seems to be plenty of open country (Figure 20).

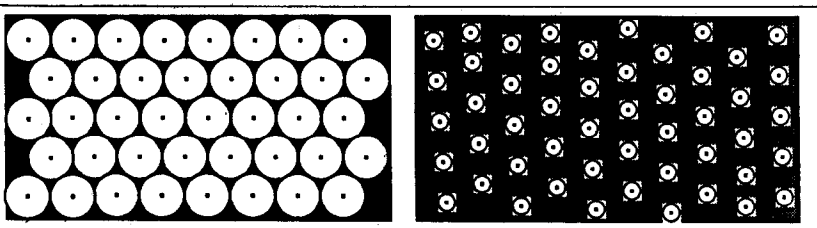

Figure 20: *A schematic representation of niche crowding.* The diameter of each circle represents the amount of resources needed for the lifestyle in a particular niche. There are 25% more "narrow niches"; yet, they are less "crowded." This is why upper and middle class people are more worried about population control; and why it is wealthy nations that attack poor ones.

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Trade lets you live partly in someone else's country. The ancient Hellenes imported wheat from Sicily and the Ukraine; so we might say that their stomachs "emigrated" to those places. Just like our gas tanks have "emigrated" to the Middle East. Most importantly, trade creates many broad, new niches for traders. And for the workers who produce the trade goods. And for the soldiers who guard the caravans and ships. Eventually, as numbers increase to fill the additional niche space, the country becomes dependent on the trade. Notice that the dense population is a consequence of trade-dependence, not a cause of it.

Colonies come next. The relatively small numbers of colonists will not reduce the masses at home. The home country remains densely populated. This will remain true even when the colonies are in space. However, the colonies do relieve the pressure on the crowded middle and upper classes!

(Notice the confluence of theories: The high specific shoreline suggests that the Atlantic states of Europe will experience high rates of cultural evolution. They will therefore feel "crowded" first, with "island countries" like England and Holland being the most severely compressed. A potential field centered on the Atlantic seaboard, and with distance based on sailing times (given the prevailing winds and ocean currents), defines the ecozone of European colonization. The connectivity of the network indicates the importance of the Iberia-to-Carribean route. The higher complexity of early mechanic societies *vis à vis* swidden farmers and hunters foreshadows the outcome. Thus, the outlines of early European colonialism can be sketched in quite easily from geography and basic psychohistorical principles. Chances are that crowded, well-to-do island countries will also be most successful in planting space colonies. Any candidates?)

Finally, the trading state will realize that it can more easily obtain the resources it needs by direct theft. This leads to aggressive war. There is nothing of the "naked ape" or "territorial imperative" involved here. Culture, not biology, is the cause. "The state is calculating," writes Colinvaux. "The soldiers are armored and cautious. The enemy is weak and a victim. The object is loot."

Colinvaux gives the ecological requisites for aggressive war. The aggressor is a rich, dense, and growing country with rising expectations. In operational terms, we can say that the country has: 1) a high population density, 2) high per capita income, and 3) high growth rates in both of these. The standard of living is rising and people expect their children to live better than they.

Intriguingly, the aggressor always believes he is fighting for liberty (his own, of course). "A higher standard of living always includes more chance to choose a path in life and is, therefore, seen as a form of freedom." This is true even if the state is a totalitarian one! In fact, Colinvaux predicted (in 1970) that Russia would eventually have more freedom in the Jeffersonian sense. She is too rich in resources. All that is wrong, he wrote, is an excess of policemen. . . . "And policemen come

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and go." Don't expect anything soon, though; *glasnost* is not exactly the Bill of Rights.

When rising population threatens the standard of living of the upper classes, aggressive war results.[28]

There must, of course, be a suitable victim. The victim is technologically backward by the standards of the aggressor, but has resources which the aggressor needs to maintain its higher standard of living and growth rate.

In short: Wealthy countries attack poor ones. Examples include: Austria-Hungary's attack on Serbia; Germany's attack on Poland; the Japanese attack on Manchuria; the British attacks on India, the Gold Coast, and other colonial areas; the United States' attacks on Mexico, the Spanish Empire, and the various Amerindian tribes[29]; the Russian and Soviet attacks on Afghanistan, Finland, the Siberian tribes; etc., etc. Applied to Africa, this theory predicted Libya to be the most likely aggressor state and Chad, the most likely victim (Figure 21). The reader is welcome to apply the

[28]In *Lucifer's Hammer,* Jerry Pournelle and Larry Niven wrote that no army ever charged into battle crying "A higher standard of living!" The ecological theory of history states that that is precisely why aggressor nations *do* go to war.

[29]Anyone want to guess how many times U.S. troops have gone into Nicaragua this century?

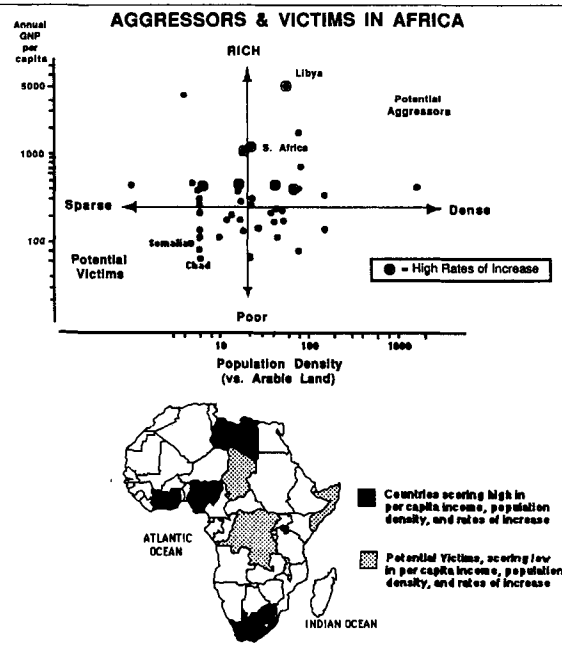

Figure 21: Analysis of population and wealth in Africa shows that only Libya and Chad are neighboring "Aggressor-Victim" countries.

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same analysis to Central America. He may find the results surprising!

Military expansion continues until the aggressor state encounters ecozone or communication boundaries; or the armies of another state. Successful aggression requires a superior military technique. (At least, superior to the victim or the victim's friends!) The Greek phalanx went through the Persian Army like . . . Well, like, bronze through cotton. The armored citizen phalanx, drilled since boyhood to fight as a unit, was a superior military technique—a walking tank—which the Persians could not hope to imitate in time. But the Greeks made little headway against other phalanx-using states, like Rome and Carthage; and they eventually fell after Rome perfected a better technique, the legion. Similarly, the legion gave way to heavily armored cavalry; the latter, to the pike square and long bow; and so on.

Among literate, technological states, military techniques can be imitated quickly. The victim or his friends can learn the new methods and use them against the aggressor. The Third Reich, for example, fell to an Allied air-and-armor *Blitzkrieg*. Modern, non-nuclear wars are, therefore, likely to be inconclusive or unsuccessful. Only a nuclear attack holds out the possibility of a successful aggression—provided no retaliation by the victim or his friends is likely!

The good news is that a nuclear war between the United States and the Soviet Union does not meet the ecological requirements. Neither side believes it has a "winning" military technique, (although there are ominous implications to SDI). More importantly, populations in both countries are low compared to the niche space available and numbers are rising slowly. Neither country is "resource-compressed" badly enough to trigger an attack on the other. To find a potential nuclear aggressor, we need an "island" country (one circumscribed by water, desert, or other unsuitable terrain) that is "rich, free, ambitious, literate, skilled in trade and commerce, but dependent on the living space of other lands for the wealth and freedom of a large population." Ecological history suggests that countries like Athens, Carthage, Venice, England, Japan, or Singapore will feel resource compression first and most severely.[30]

None of today's "island" countries is severely compressed, although Japan *is* waging a rather aggressive trade policy. However, the future may be a different story. Populations continue to grow. (Slow or fast, it doesn't matter; it's the *growth itself* that matters.) Colinvaux suspects that the next century may see a small scale atomic attack by a rich "island" nation on a weak "victim" nation, with the aggressor banking on the fact that the Super Powers will accept the *fait accompli* rather than risk world-wide conflagration.

"The stars at night are no less beautiful now that we can measure their dis-

[30]We like to think of England as "peace-loving." Just ask the Irish, Bengalis, Kenyans, and others! Don't forget England leveraged the biggest real estate deal in history on the point of a bayonet!

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tance and magnitude and calculate their size and age.''

(Colin Renfrew, paraphrased)

This article is too short to do justice to the broad scope of psychohistory. What about the roles of disease or natural disasters? The former was surely an issue in the destruction of the Amerindian societies, and in the triumph of the European towns over the feudal countryside.[31] We have not even addressed such crucial issues as operational definitions of terms or the reliability of measurements (Just what is the population of the Soviet Union? How do you know?). These issues are important. Catastrophe theory (and the newly emerging ''Chaos Theory'') demonstrate that tiny differences in the input variables can cause a big difference in system behavior. Yet, too many terms in the cultural sciences are poorly defined. (Is Russia an *evil* empire? Are nuclear power plants *safe?* What do such words *mean?*) What is a war? Singer and Small compared lists of wars compiled by different researchers. No two lists were alike!

But we must stop somewhere.

I have tried to present the various theories and methods of psychohistory as clearly and accurately as I could; but I have necessarily omitted a great deal of detail and supporting information. I hope I have not distorted or misrepresented anyone's theory. Interested readers should consult the memeography at the end of the article.

As far as I know, this is the first time all these ideas have been put together: techniques from quality control, from topology, from system analysis; ideas from biology and ecology, from behavioral psychology, from industrial management. It is not clear how they all fit together, or even if they do! No doubt some will fall by the wayside. Perhaps there should be a conference—call it the Foundation Conference—where Colinvaux, Renfrew, Rashevsky, Harris, and the rest can get together and discuss the issues!

We have seen that a scientific history is possible. ''Empiricists'' like Hamblin have discovered the underlying lawfulness of social behavior. ''Model-builders'' like Rashevsky and Renfrew have constructed mathematical facsimiles of cultural processes. ''Ecologists'' like Harris and Colinvaux have sketched in plausible theories of material causality. Psychohistory is possible; but is it desirable? What are the implications for human dignity? Could some ''Babbage Society'' be meeting at this very moment?

The meme that science is somehow dehumanizing is strongly entrenched in our society. As one intellectual recently wrote, ''there is a growing sense that the time-honored methods of history, based largely on those of the natural sciences, are conceptually and morally bankrupt.'' The statement that scientific methods are ''time honored'' in any of the social disciplines will no doubt surprise *Analog* readers, but the attitude behind the comment will not.

[31]The densely populated towns were hothouses of disease to which the townsmen became immunized. When the townsmen ventured forth into the countryside, Nigel Calder wrote, they felled their opponents with a few well-aimed sneezes.

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Actually science has been turning the humanities upside down for quite a while. The physicists's first venture into archeology—radiocarbon dating—resulted in a complete revolution of prehistoric chronology, one which some archeologists *still* refuse to accept. Similarly, the biologists' mapping of gene frequencies has uncovered still more interesting facts, like the Attack of the Milk-Drinking Mutants, whose peculiar ability to digest milk as adults led to the Cow-and-Plow revolution, and gave rise to the (get this) Aryan, Semite, and Sudanic Black races.[32]

However, a detailed timetable of the future, a là Hari Seldon, may not be possible. History is an evolutionary process. Changes are cumulative and each moment *grows* into the next. Random fluctuations can be amplified by sequential dependence. "For want of a nail, a shoe was lost. . . ." Given dinosaurs and Darwin's theory, could a biologist forecast a giraffe? Look at our trouble forecasting the weather—and that's only physics!

But, just as meteorologists can reasonably forecast the climate, if not the weather; and a biologist might forecast "long-necked, tree-top browsers," if not the diplodocus or giraffe; the psychohistorian may be able to forecast the broad outlines of the future. Certainly, they may be able to shed light on what's happening now!

There is no doubt of one thing. If there *are* such things as historical forces, *they are operating whether we are aware of them or not!* Is there greater human dignity in being the victim of circumstances than there is in trying to study and change them? Science does not restrict the human spirit, it expands it. We fly, despite the laws of gravity! As Marvin Harris has written, subjectivity and self-deception are not the measures of being human.

By better understanding the processes of history, we can be more in charge of our own lives. It's past time we stopped blaming the gods, or bad luck, or the Rosicrucians, or . . . the Babbage Society for everything that happens. Relying on ideologies of what *should* be is no substitute for careful study of what *is*.

And, perhaps, that is one reason why the idea of a scientific history will be ridiculed and denounced—either as "fascist" or "communist" depending on the denouncer's ideology. There are those with a vested interest in mystifying the causes of history, in maintaining the *status quo*.

Does science have a role in culture? Let Marvin Harris answer:

"[T]here are many ways of knowing, but . . . it is not mere ethnocentric puffery to assert that science is a way of knowing that has a uniquely transcendent value for all human beings. In the entire course of prehistory and history only one way of knowing has encouraged its practitioners to doubt their own premises and to systematically expose their own conclusions to the hostile scrutiny of nonbelievers. . . . Unless

[32]Brothers under the skin, so to speak. The genes are there, regardless of racist theories. Genetically, the white and black races are more closely related to each other than either is to the yellow, brown, or red. They have a More Recent Common Ancestor.

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[critics] can show how some other universalistic system of knowing leads to more acceptable criteria of truth, their attempt to subvert the universal credibility of science in the name of cultural relativism . . . is a crime against humanity. It is a crime against humanity because the real alternative to science is not anarchy, but ideology; not peaceful artists, philosophers, and anthropologists, but aggressive fanatics and messiahs eager to annihilate each other and the whole world if need be in order to prove their point." ■

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●Space is to place what eternity is to time.

Joseph Joubert

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on gaming

Matthew J. Costello

There's a moment in H.P. Lovecraft's story *At the Mountains of Madness* when, for a moment, the heavy sense of other-worldly horror yields to a more clinical, almost scientific view.

(I am, of course, talking about Lovecraft's story of an ancient civilization of Old Ones in Antarctica—monstrous deities who bred horrible slave-beings and seemed, for a time, to rule the world.)

An expedition slowly uncovers the maddening evidence of this now-frozen civilization. And before we can begin to worry about the narrator's sanity (about to vanish) and the return of these creatures from beyond, the story begins to read like a science fiction mystery—a calm, methodical uncovering of the evidence of alien beings on earth.

Eventually, we quickly cross to out-and-out purplish horror, as only Lovecraft could serve it up.

For me, whenever I see the science fiction classic *The Thing* (both the 1951 and 1982 versions) and *Alien*, I think of Lovecraft's story, and his terrible universe where the darkest of beings await only the slightest chink in the dimensional barrier to step out and bite off our heads like a celery stalk.

There has been, for many years now, an award-winning role-playing game of the Lovecraftian universe, set in the roaring twenties. (*Call of Cthulhu* is one of gaming's true masterpieces, and you'd be surprised who's played the game.)

Now there's a board game, *Arkham Horror* (Chaosium Inc., P.O. Box 6302, Albany, CA 94706), licensed by Arkham House and filled with all the deities and claptrap of *Cthulhu*. And while not anywhere near as brilliant a game as *Call of Cthulhu*, it's an entertaining and engaging piece of work.

The colorful board features some of the highlights of Lovecraft's mythical town of Arkham—the Aylesbury Graveyard, North Church, and dear old Miskatonic University. A simple track of spaces weaves its way around such locales, and others, including the Lighthouse, Devil's Beach, and the Sanitarium.

Players select an investigator, such as Gloria Goldberg, or Monterey Jack, each rated for abilities derived from *Call of Cthulhu* such as: Fast Talk, Fight, Knowledge, and Sneak. Each investigator also has sanity and strength points which they quickly begin using. You also start the game with an initial supply of weapons and spells.

As the game begins, a dimensional gate opens and some of Cthulhu's minions begin entering the peaceful burg of Arkham. Their movement is controlled, so the players can try to avoid the nasties while attempting to control the dimensional doorway.

Investigators can enter any of the

(Continued on page 88)

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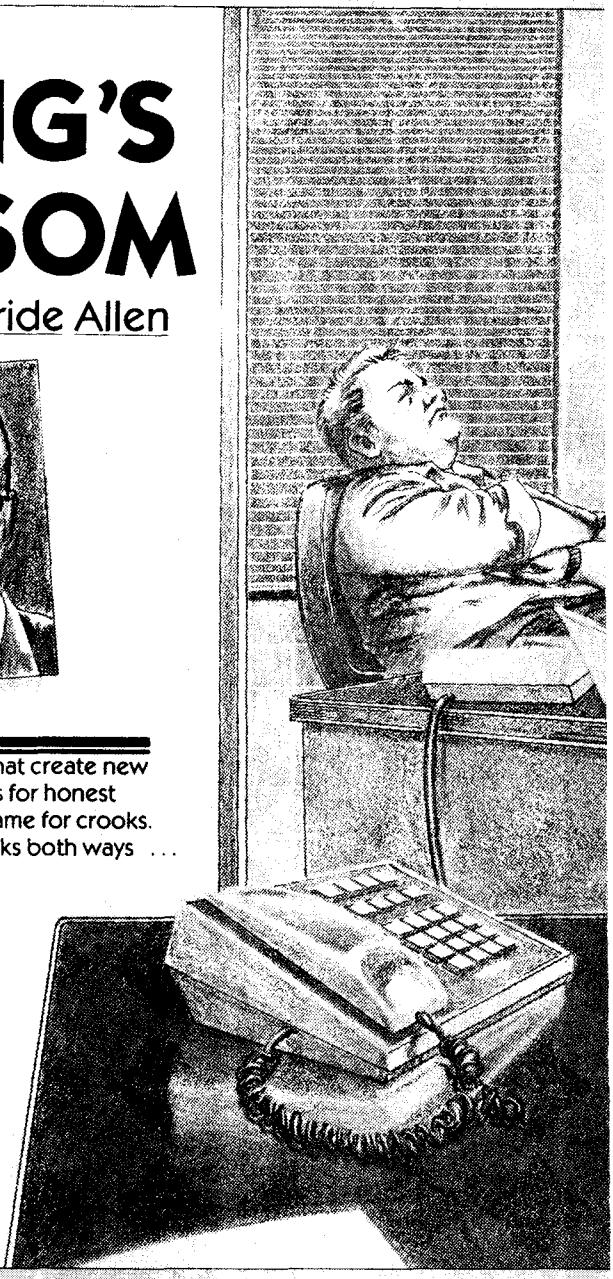
THING'S RANSOM

Roger MacBride Allen

Developments that create new opportunities for honest citizens do the same for crooks. Of course, that works both ways . . .



William R. Warren, Jr.

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Kidnapping is stupid. There is no dumber major crime.

Think about it. No matter how brilliant the scheme for snatching the victim, no matter how cleverly concealed the hideout, no matter how careful the protections against phone taps and surveillance, sooner or later it comes down to a hopelessly risky task: collecting the ransom.

Think about *that*. The kidnapper literally has to make an appointment with the victim and the cops to collect his earnings. Forget clever ransom-delivery orders, forget searching for safety in complex instructions. Sooner or later it comes down to a suitcase full of cash the bad guy has to come and get. All we cops have to do is watch the suitcase and wait for the perpetrator to claim his luggage. And in this day of micro-transmitters, infrared scopes, laser motion sensors and so on, it's awfully hard for the perp to sneak up on the money without us noticing, even in the dark from a kilometer away during a driving rainstorm. Beyond question, the odds have always been against the kidnapper, and modern technology has made them worse.

That's the main weak point with kidnapping: the ransom pickup. Last figures I saw, eighty-three percent of all kidnappers are caught, and ninety-five percent of the ones collared are nabbed while attempting to scoop the ransom.

But, even assuming that we cops drop the ball and let the perp grab the dough, assuming the victim is released unharmed without having gotten a look at the guy or the hideout, or otherwise giving investigators a lead, assuming we haven't traced the phone lines or gotten fingerprints or a license plate—even so the bad guy's problems have barely begun.

See, your average kidnapping is a cash-and-carry operation. The ransom *has* to be in cash, because any other form of negotiable instrument is too easy to trace. And cash is a *drag*. It's bad enough lugging around a huge suitcase full of bills when you're trying to make a getaway: but the cash is still a problem after the fact as well.

First off, the cops always have some advance notice before the ransom money is delivered. We nearly always have time to set up the money—even a few hours is enough to get the serial numbers noted down—just run the bills through a document scanner and bingo. But even if we didn't get the serial numbers, (which we always do) ransom cash can be tagged plenty of ways—radioisotopic tracers, ultraviolet or infrared inking, microdot radio transmitters, delayed-appearance inks, you name it. It's not like bank robbery, where there's only seconds before you have to hand over the dough. (Even then, most banks have some premarked bills on hand, just in case.) In kidnapping, time works for the cops.

Then consider this: Sooner or later, that marked cash is going to be spotted. So how the hell do you get rid of the dirty bills and convert them into something spendable? You can go to a money fence who will sell you "clean" cash (which may simply be the marked bills he's gotten from some other poor slob) for maybe fifty cents on the dollar, but even after he's taken a hundred grand and given you fifty, who's to say he won't double-cross you? Half the fences

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and money laundries in the country are stoolies or police undercover operations. The risks of laundering are as great as those of leaving the money alone—which is to say, pretty damn high.

You don't dare put ransom money in a bank, of course. Even if by some miracles the cash isn't tagged, or even if you spot all the tags and get rid of them, wandering into the local savings and loan with a suitcase full of hundreds to open an account is bound to raise suspicions.

Cash is so bulky and awkward as to be unusable in even modest-sized transactions. Imagine lugging around the actual cash represented by the bits of plastic and paper you carry in your purse or wallet. If your credit limit's fairly high and you've got a few thou socked away in this account or that, you're talking several *pounds* of currency in medium-sized denominations. Lighter if you lug it in hundreds and thousands, but who's going to have change in the till for a G-note? Only crooks make major purchases in cash, for the very good reason that no one else would put up with the inconvenience. *You* try paying for everything in hundred dollar bills. Try buying a house, or a car, without someone wondering why you have to do business that way.

For that matter, hardly anyone uses currency at *all* these days, what with bank cards and credit cards and so on. Pump the gas, pick out the groceries, then just zip your card through the mag reader. After the deflation crisis, you barely even see *twenties* anymore, let alone hundreds. Ten, twelve years ago it wasn't so bad, but try paying for groceries with a C-note without attracting attention today. Every eye in the store will notice that Ben Franklin. Do it routinely, again and again, and you're asking to be mugged. Or arrested.

Now imagine that every dollar you spend might be *the* marked bill they'll spot. That every dollar you spend is literally an engraved invitation to the feds and the cops and the banks and your fellow crooks to come get you.

So, unfortunately, for the successful kidnapper with a million bucks burning a hole in his pocket, he has to spend the bread in cash, very slowly and *very* carefully, to avoid getting caught. So slowly and carefully that your average semi-intelligent hood figures it isn't worth the effort. Starting to see why I said it was a dumb crime? You have to be *plenty* dumb to take such chances.

So kidnapping is stupid. Well, at least it used to be. Until Vreeblemeyer. He turned all those cop's advantages on their ears. Yeah, you've heard of him, but not way he really was. He was smart, not the dummy we cops claimed he was. You've never heard the real story, and I hope that remains true for the general public. I got enough aggravation. See, he perfected the cash-free kidnap. And without cash, kidnapping is brilliant.

For me, Vreeblemeyer was the sort of case where the cop pins the perp's picture up on his office wall. Why we do that, I don't know. Maybe as a warning, maybe to remind us six months later that he's still out there—or maybe so that staring at the bad guy will help us understand him, get us inside his skull and figure out what he'll do next.

It was a lousy photo I had of him, up

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on the bulletin board, a head-and-shoulders shot from the State Department visa files. Grainy, no 3-D, colors a little off. A balding, bespectacled clerk's face, an old-fashioned looking suit with a precisely tied necktie.

The background from the FBI and the Swiss cops wasn't much—fifty-five years old, never married. Always lived alone, as best could be told. An accountant of twenty years' standing at SuisseBank, one of the larger Swiss financial institutions. Unexpectedly took early retirement after decades of faultless, if uninspired service. A staid, colorless functionary who kept to himself and got by on a salary that was just barely adequate. The Swiss cops told me that six months after he quit, no one at the office could remember him clearly. That was about the limits of our knowledge. One reason there was so little information is that the guy had no police record until—well, we'll come to that. I'm getting ahead of myself.

Anyway, to continue with the folly of kidnapping: All these problems for the perp should be great news for law enforcement—but there's a flaw. Cracking a kidnap is too easy. It's for dummies. Technically, the old Lindbergh law is still in effect, so the FBI has the legal authority to get involved in a kidnap case, but they don't even bother for the most part. It's too easy. Besides, the kidnapper is practically extinct anyway. So what cases do arise are up to the local cops to handle.

But in this day and age, even the local police are up against lots of highly profitable crimes that require *real* smarts —computer fraud, organ theft (could *you* steal a guy's kidney without his noticing?) shock-wires, lottery manipulation, satellite data diversion, industrial espionage, holographic counterfeiting and forgery. You have to assign the *real* smart cops to those rackets. Solving a kidnapping requires far less brainpower or courage or initiative. So the guys assigned to the kidnap squad tend to be elderly cops assumed to lack those qualities. Such as myself. My name's Vinlander, by the way. Lieutenant Joe Vinlander.

There are some real pips down in the bullpen of the NYPD kidnap squad. Old farts kicked upstairs with twelve seconds left before retirement and no other place to transfer them without the danger of someone getting hurt.

It's a lovely place, the squad room. Slate-grey walls, slate-grey desks, old men with slate-grey faces dozing in their slate-grey chairs. And the noise when we all happen to be awake at the same time is something to hear. A horrid racket of old guys coughing wretchedly into much-laundered grey-green handkerchiefs that used to be white, the rattle of little bottles full of multicolored pills to be taken before, during, and after every meal, the squealing feedback of hearing aids turned up too high, and the endless schmoozing over doctor's orders and retirement villages. A lovely group.

Okay, so I've been known to exaggerate. But you should understand just what sort of crime-fighting guys we're talking about here that are up against kidnappers.

I bet Heinreich W. Vreeblemeyer understood it. That was half the problem. The other half was that he was smart. He beat the system.

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The bastard.

The word came in the usual way. At 10 A.M. one fine morning, the 911 operator shunted us a phone call from a frantic husband. His wife had been snatched from the Dakota, a permanently trendy apartment house by Central Park. This isn't really that family's story, it never got into the papers, and there's no call to dump a lot of unwanted PR in their laps, so I'll just call them the Smiths.

I got handed the case and starting pushing the usual buttons and making the usual calls to dispatch the standard tech assistance crew to the scene. By the time I got there, an hour after the call came in, there were fifteen police officers of one sort or another crawling over that apartment, photographing things that didn't need photographing, burying the joint under a blizzard of fingerprint powder, and hooking about forty pounds of hardware up to Smith's phone—tracers and recorders and voice-stress analyzers and line-status controllers, all the stuff back in the lab that they hadn't gotten to use in a while. The whole place was in chaos; just the sort of uproar the distraught victim of a nasty crime needs to face.

The place was so thick with cops and cop hardware that I couldn't find Mr. Smith at first. Finally I spotted a thin, middle-aged gent in a better-cut suit than any plainclothes cop could afford. He was standing all alone and lonely in the middle of the living room, a wild and nervy look in his eyes. I straightened the wrinkled jacket of my own baggy suit, tried to force the right expression of calm competence onto my doughy face, and went over to him, stepping over the snaking cables and equipment boxes as gracefully as my overfed, under-exercised body would let me. It's no fun being an overage cop.

"Mr. Smith? I'm Lieutenant Vinlander, kidnap squad." He looked up and nodded at me eagerly, obviously glad to talk to someone who was allegedly in charge. "Is there any place we can talk?"

"Mmmm? Oh, yes, the bedroom I suppose." He turned and led me through the mob scene to the master bedroom and shut the door. It was a frilly, feminine sort of room, obviously made up to suit the wife's tastes rather than the husband's. He sat down on the edge of the bed, stood up, went over to an old-fashioned dresser and drummed his fingers on it. There was a shallow dish full of a woman's everyday jewelry on the dresser. He started playing with the stuff, running his fingers through the brooches and earrings, working his hands over a beaded necklace like it was a rosary.

He seemed to hesitate, as if telling the story would make it dangerously more real. I didn't want to push him. Badger someone in that fragile state and they aren't likely to cooperate with you later on. Finally, he seemed to get hold of himself and plunged into saying his piece. "It's hard to face the fact that she's really gone," he said. "She was such a gentle person, I just can't believe anyone would want to harm her."

I winced inside. It's bad news when they start talking about the victim in the past tense. He was already imagining her as dead. There would be some shrink bills in this family when this was

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over. "She's not gone," I said, as firmly and gently as I could. "She's still with us. She's just missing, that's all. Someone's taken her away for some reason. We'll find that someone and get her back. And I promise you, that someone wouldn't dare harm her. The risks are too great. It's bad business. So you just sit down and tell me all about it, and try not to worry. Tell me what happened."

So the poor little guy sat down on the edge of the big flouncy bed and told the tale, the same story I'd heard a thousand times. Coming home, finding the door ajar, the apartment in disorder. The chilling horror of finding a note made in paste-up letters that said nothing but "Expect A Call." Neatly clipped to the note, the 3-D Polaroid shot of the wife, blindfolded and gagged, a man's hand holding a gun to her head.

It gave me the old familiar bad feeling in my mouth, the grim lump of depression in my gut. I'd been through it so many times, with so many sad little worried spouses and relatives. The whole dreary *danse macabre* was beginning all over again. He ended the tale, and that was my cue to spout off more reassuring words, to tell him what to expect, to give the orders to get the uniformed officers to do what they already knew to do.

Then the dreary routine of working a kidnap began. The dismal and fruitless searches that got nowhere—check the note and the photo and the whole apartment for the perp's fingerprints, which wouldn't be there. Try to trace the untraceable gun purchase.

We knew going in that none of that ever worked. We would have to go through the motions, knowing full well that the result would have to wait until there was a phone call to tap and trace, a more complete ransom note to analyze, until the ransom drop gave us a chance to nail him, until there was ransom cash to mark the track.

At least I thought it was going to be the same old story, until the call came back from the fingerprint lab. They had found prints, good prints, on the photo and the note, and matches for those prints on the door and other places. Cross-checks ruled out Mr. and Mrs. Smith. (He gave us prints for the purpose of running the check, and the lab boys lifted good prints for his wife off her make-up containers and an unwashed water glass she had used that morning.) Not believing their luck, they were running the prints through the FBI files.

But I was almost too busy with other leads to worry about that. Working from the gun's image in the photograph of Mrs. Smith (the make was identifiable), two sergeants were checking recent purchases in the New York area—a job which the new gun control laws made easier. Illegal gun sales are much tougher than they used to be. But even so, usually a gun trace is as bad as a fingerprint search. I didn't hold out much hope for that angle, either.

Then two reports came across my desk at the same time: The FBI had nailed the prints as belonging to a duly registered resident alien, native to Switzerland and living in New York. Name: Heinrich W. Vreeblemeyer, 410 Riverside Drive. Twelfth floor apartment.

And a gent of the same name had

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used his *charge card* to buy a gun matching the one in the Polaroid shot of Mrs. Smith bound and gagged. Had also used the same card in the same store to buy a Polaroid 3-D camera and film. Used his *charge* card—the most traceable, informative, dangerous thing he could do. I couldn't believe it. Even for a kidnapper, this was getting pretty stupid. I didn't care. It was a lead. I set records getting a warrant.

It was about nine P.M. when we showed up at Vreeblemeyer's apartment building. A check of his mailbox in the lobby showed it about three days full. The last three day's newspapers were stacked up outside the apartment door. A quiet canvas of the doorman and the occupants of the apartments on the floor came up empty—no one had seen the guy in days.

We watched the apartment for an hour or two, this way and that. Mostly we snooped from the roof of an adjoining building. No lights or any sign of movement inside the apartment, and a laser-sensor mike beamed onto the windows couldn't pick up any noise inside.

So we popped the door.

I hate hitting a door. Kicking it in, diving through, wondering if the perp is waiting just inside with a shotgun pointed at where your gut's going to be in a second.

But not that time. No one was there. We hadn't expected anyone to be. But you ought to be able to get a lead on a guy from his apartment.

Instead, I started worrying when I saw that apartment. Started shifting Vreeblemeyer from the *dumb* category into maybe *smart*. See, that apartment was neat. And that equals smart.

Now if you're a civilian, you're going to ask how that figures. Plenty of dumb people are neat, plenty of smart guys are slobs. But in a crook, neatness means there's something upstairs. For a crook, sloppy equals dumb. Sloppy leaves too many clues.

So with the brilliant credit-card move on file, I expected to bust into a room full of dirty socks and empty Chinese food boxes. Happy hunting ground for a detective, because you can run down to the Chinese restaurant named on the box and get a description of the guy who comes in every night—or stake out the place in case he still eats at the same place even though he's skipped out on the apartment. Or you can check the closets—there might be some old photos left in an album, or a calendar marked up somehow. Or an old map that's gotten shoved behind the couch, with the victim's house marked on it. Or old phone bills left around that might give a clue where he's skipped to. Hell, we nailed one guy by the vacation brochures he left behind. Like I said, dumb crooks are sloppy enough to leave stuff.

But not friend Vreeblemeyer. That place was neat as a pin. It was more than just neat. It was a neat, finicky man's place that had been cleaned and polished to an inch of its life just before the guy took off, so as to leave nothing behind. No food at all left in the fridge, all the dishes done, all the drawers emptied, all the furniture dusted and straightened, with every little throw pillow just so. No revealing papers to be found anywhere. No clothes. Nothing left behind but unpaid bills. (What's skipping out on a credit card to a kidnapper?) The whole place was polished

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and vacuumed and stripped of any shred of personality, as bare and sterile as a hotel room. It was a place no one was ever coming back to.

We worked that apartment as best we could, but it didn't get us anywhere. Vreeblemeyer was long gone. He had used the charge card not because he was dumb, but because he no longer cared if we looked at his past. Vreeblemeyer wasn't coming back, and the trail we were following led back to where he had been, not to where he was going.

He was smart enough to let us run on a wild goose chase. That worried me. I was starting to get my first mental image of this guy—he was a careful planner, sitting down and thoughtfully researching every detail before he made his first move. A loner, too, and that was bad—no dopey accomplices who'd be easy to find.

In short, one broken door and nothing to show for it. We were back to the weary, dreary job of waiting for the kidnapper to call.

The ransom call came in at nine A.M. the next morning, almost exactly 24 hours after Mrs. Smith had been snatched. That was a nice timing. Just long enough so that shock and worry overlapped with sleepless exhaustion to chop Mr. Smith's critical faculties down to nothing. Any sooner and Smith wouldn't be rattled. Any later, and Smith might have managed to get a little sleep, a little rest.

So the phone rang, and all the sleekly silent electronic equipment came on, and Smith answered the phone.

"Hello?"

"Mr. Smith." I listened carefully on headphones. It was a calm, precise, colorless voice, laced with the slightest and most careful of accents. "Your wife is here, and quite safe. In order for me to return her, I require payment of two hundred fifty thousand dollars by nightfall. If I do not receive it by eight o'clock, she will die. Please be ready to take down my instruction."

"I can't get hold of that amount of cash by tonight," Smith protested.

"You will not need to. You are to make an electronic funds transfer of that amount to SuisseBank, of Bern, Switzerland."

Smith looked at me, and I looked at him. An *e-fund* transfer? Why go to all that trouble when just turning himself in would be so much easier and have the same effect? I downgraded Vreeblemeyer back down to dumb, to *mega*-dumb. I gestured to Smith to go on, to respond.

"To SuisseBank?"

"That is correct. Their Standard Bank InterTransfer Number is E7820-SU6018. You are to make the transfer in the form of a deposit to account NAR-18083. I will monitor that account. Within two hours of the deposit being made, your wife will be freed. If the deposit is not made by eight tonight, your wife is dead. That is all." We heard Vreeblemeyer hang up, and I took off the headphones.

I looked to the phone tech, but she just shook her head. "We got a trace and a location. But they're useless. It's a pay phone in the Times Square subway station. He could already be in a cab or a subway or a bus going anywhere."

"Yeah," I said, a bit distracted. *E-fund transfer?* "Well, get through to the transit cops and get an officer to stand

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over that phone until the print and forensic team gets there." Another piece of pointless standard operating procedure. Maybe he left prints, maybe he managed to forget a crib sheet or something at the scene. Normally it was worth a shot. Not with a neatnik like Vreeblemeyer.

But all of that didn't even matter. A deposit to a *bank account?* This guy was a major loon. It was a nice dodge, in a way. After all, we couldn't nail him when the money went *into* the numbered account. That would at least slow us down. But sooner or later he'd have to show up to take it out, cash in his chips—and we'd have him. So what was the point?

"Lieutenant Vinlander?" It was Smith, tapping me on the shoulder. "Do we do it? Do we go along with what he said? I have the money, that's no problem."

I looked at the poor guy and nodded. I was forgetting about him, about him and his wife in all this. Vreeblemeyer. He was breaking too many of the rules of this game. There was something not quite right about what was going on. "Yeah, you go ahead and pay it, Mr. Smith. Pay it and get your wife back. Once he goes to get that money—that's the fastest way for us to catch him."

I won't leave you in suspense—Smith called his bank, ordered the e-fund transfer, and four hours later his wife was back in his arms. End of their story. Beginning of mine.

And the beginning of my education on the subject of Swiss banks. In a real bank, an American bank, if you have a crook using an account, or can show that the proceeds of an account came from the commission of a crime, the bank rolls over and plays dead. You can get all the information you want—addresses, running balances, cooperation toward capture, account freezes. In Switzerland—well, a four P.M. visit to Herr Vogel at the Swiss consulate in New York put me wise.

Herr Vogel was in charge of U.S./Swiss security and police liaison, extradition requests and similar matters. He did not look Swiss. He wore a rumpled sports coat and slacks instead of a neatly pressed suit, his desk was a mess and not at all orderly, he was dark featured, almost olive-complexioned. I was expecting a tight-lipped old bureaucrat and I got a relaxed and open young man. Suited me.

He ushered me in most cordially, served me a really first rate cup of coffee (which I could use by that time), and made sure I was comfortable before we got down to business. "So, what is it that we can be doing for you, Lieutenant?"

"It concerns a Swiss national resident in this country. It seems he has committed a kidnapping. After the payment of the ransom, the victim was released unharmed."

"I'm afraid I don't understand," Vogel said, in the most friendly tones. "I apologize that a citizen of Switzerland has done a crime, but surely he is under your jurisdiction?"

"Indeed he is, Herr Vogel. At least for the moment. But as you may know, most kidnappers are captured when attempting to collect the ransom. It is in effecting that capture that we need the help of Swiss authorities."

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"The ransom was placed in Switzerland for some reason?" Vogel asked.

"Precisely."

"Well, I see no difficulty," Vogel said, gesturing expansively. "We can certainly make arrangements for Swiss officials to watch the pickup point and effect either the capture or surveillance of the person who collects the cash, just as you wish." He leaned back in his chair and smiled benevolently.

"It isn't exactly *cash* that he will be collecting, Herr Vogel." I said. "The money was deposited in a numbered account in a Swiss bank. Here's the bank name and the account number," I said, sliding a piece of paper across the desk.

But at the word "bank" Vogel had metamorphosed. He had turned Swiss. All his breezy courtesy, his smile, his informality vanished. He sat up straight at his desk, carefully laid his hands flat on the blotter, and looked at me with an awful solemnity. "If the money is in a Swiss Bank (he pronounced the word as if it was capitalized) then we can do nothing," he declared in a voice that had dropped a full octave. "Our Banking laws have always been most strict, and most carefully protected the rights of the depositor. They have recently been strengthened. You tell me your victim was released unharmed. Unless the crime was a violent one, or committed inside Switzerland, it is quite impossible for us to assist in any action to reveal any information about an account or a depositor. The privacy and sanctity of an account in a Swiss Bank is of signal importance to our government."

"But all we want to do is have someone watch the door of the bank and wait for this guy to show up," I protested.

"Absolutely not," he said flatly. "I must warn you that if your people attempt any such illegal surveillance of a Bank depositor, you will be liable to prosecution under Swiss law."

"Then how about getting the account frozen until we can show the funds are the proceeds of crime?"

Vogel glared at me and shook his head without even deigning to reply.

I couldn't believe this. "Maybe we can at least set up some arrangement to monitor transactions, watch deposits and withdrawals?"

"Out of the question. All the things you are suggesting are quite improper."

"So is dragging someone out of their home and tying them up!" I snapped. "We need a look at that bank account so we can catch a kidnapper!"

He looked at me in shocked horror, as if I was suggesting that we burn down the Vatican to kill a mosquito. "We cannot tolerate such extreme measures in pursuit of a suspect in a nonviolent crime."

Kidnapping nonviolent? I tried to keep from getting upset. I didn't need another heart attack. "Herr Vogel. A Swiss national has grabbed a U.S. citizen, threatened her life and held her for ransom. What you're telling is that your government wants to shield him, help him get away with it!" He shifted slightly in his chair, and didn't return my gaze. "There hasn't been any publicity about this so far, but that could change—and the word so far isn't going to help your image—or your tourist or investment trade."

That seemed to register. Vogel under-

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stood dollar signs. "I understand, Lieutenant Vinlander," he said testily. "But the law is quite specific. If committed outside Switzerland, the crime must be demonstrated to be *violent* before we can do anything. But you yourself said no one was hurt."

I grasped at that straw. "Could you help me if I could prove this *was* a violent kidnapping, even though no one was injured?"

Vogel hesitated. "Possibly. I might be able to get you some small assistance," he said in a prim little voice.

"Lemme use your phone," I said, already jumping up and grabbing for it. I punched up the kidnap squad and got through to Flattery. "Yeah, Flattery, run down to the lab and grab the Smith Polaroid. Get it down to me at the Swiss Consulate fast." I put down the phone and smiled at Vogel. "I'll be in the foyer. Back in to you when I have my proof. Later. I know it's near the end of the day, but maybe you could wait for it. Neaten your files for a while. It's kind of important." I smiled and went out the door. I wanted him to be alone, thinking about losing investment and tourist money.

An hour later, thanks to Flattery being a bit quicker off the mark than I had figured, I had the sharp, clear, 3-D photo of Mrs. Smith with a gun held to her head. "If holding someone at gunpoint isn't violence, I don't know what is," I said cheerfully. "If you disagree, we can put that photo on the front of the *New York Post* and let your people convince the public otherwise. So can we get cooperation on this or what?"

Vogel looked at the photo, grunted, and threw it down on his desk. He leaned back in his chair and shook his head at me. "Point taken. But I have been researching the situation in the meantime." He hesitated for a moment. "I *want* to help you, don't get me wrong. But the Banks are important to us—and they are powerful. And SuisseBank is among the most important, and the most powerful—and the most successful and modern. They closed their last public branch a month ago."

"What? How can they be successful and close all their offices?"

"Oh, there is still the *main* office—but I'm told that merely handles administrative work and the safe deposit section, nothing more. That office opens accounts, but it does not accept deposits or withdrawals. Indeed, they have received a government waiver permitting them to stop handling cash at all."

"That doesn't exactly sound like a successful bank to me."

"When was the last time you set foot in the main office of your own bank?" Vogel asked. I noticed that a reference to a mere American bank was not pronounced in capitals.

"Not for a few months, actually, when there was a glitch and the auto teller ate my bank card. I had to go in and straighten that out. Since then, I haven't had to. My pay is deposited automatically. When I need cash I use one of the automatic teller machines—" I stopped myself and looked up in horrified alarm. "Are you telling me that the automatic teller machines, the ATMs, are the only way to deal with SuisseBank accounts?" Even as I asked it, my blood went cold. I suddenly saw the future of kidnapping, and it was not a happy one

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for me. I sat down heavily in the visitor's chair.

"That and the sort of e-fund transfer Vreeblemeyer used," Vogel said. "They *have* no office for you to watch and wait for Vreeblemeyer to appear. Just wires into every major ATM network in the world, from Moscow to New York, Rio to Tokyo."

"He could collect the damn money *anywhere,*" I said in horror. All of a sudden, ninety-five percent of all kidnappers caught—the percentage nabbed at the ransom drop—could get clean away. My stomach started tying itself into knots.

"He already has collected. Working on the assumption that you could prove violence, I got a preliminary order to look into that account. I got a computer report just before you came back in." He shoved the paper across the desk.

It was a simple printout. Date, time, place, transaction, amount.

The first entry was for eleven A.M. this morning. A balance inquiry, making sure the money had been deposited. I read further, keeping the times straight in my head. Mrs. Smith had been released about two P.M. At four P.M., Vreeblemeyer had used a machine at JFK Airport: withdrawal, one thousand dollars—the usual max for a cash withdrawal these days. Five P.M., Cleveland. Withdrawal from an airport services ATM there: one thousand bucks. Six P.M.—twenty minutes ago—Columbus, Ohio: another grand from an airport machine. This guy was traveling. But one thing struck me as odd. "Why didn't he withdraw any money the first time, when he did the balance inquiry just before he let Smith go?" I asked.

"Because he knows there is a certain time lag between the moment a deposit is credited and the time it is actually cleared and available for disbursement. In the old days Banks held checks for a week or more to be certain there was enough money in the account drawn upon. Even today, the confirming computer relink takes a few hours. In a large fund transfer, the receiving Bank's computer always checks back with the sending Bank before making the credited funds available. He was just being careful."

I could feel the sweat pop out of my forehead. We were in trouble. I swallowed hard and looked up at Vogel in mounting alarm. "Can't you do something? Can't you freeze the account, stop him from using it?"

Vogel shook his head again, and I noticed a thin film of perspiration on his brow. He could see how much trouble this could mean for his government. "I tried, believe me. You put the fear of God in me during our earlier talk. I tried. There is nothing that can be done. It's physically impossible. The computer programming is compartmentalized, and sealed, you see."

He pulled a perfect Swiss white linen handkerchief from his rumpled suit and mopped his brow. "We have the police power to monitor an account with cause, but that is all. The numbered accounts are supposed to be inviolate.

"The trouble is, the very term 'numbered account' has become pejorative, linked to criminal activities. After a recent and unfortunate liberalization of the Banking laws policy was established, Swiss authorities were required to cooperate with foreign investigators who

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showed even the slightest evidence of possible wrongdoing. Police and prosecutors and tax examiners around the world were getting us to freeze accounts on any pretext. They blocked the accounts and asked questions later, exposing the whole system and many legitimate clients to financial disorder and embarrassment.

"That over-liberal law was withdrawn, and the present much more restrictive law made in order to prevent such harassment of Banking clients. SuisseBank's computer is now programmed, in full accordance with the new Swiss Banking laws, so as to refuse to block or freeze *any* account in good standing. Under certain circumstances accounts may be monitored for thirty banking days, the monitoring subject to renewal at the end of that time. The programming cannot be overridden without shutting down the entire system, and starting over.

"Obviously, the Bank will refuse to do that unless it is forced to—which is to say, until the law is changed again." Vogel looked at me apologetically. "In most cases, the thirty-day monitoring law is quite adequate. Tracking the money is most valuable in investigation, and besides, most people want to *hide* money in their numbered accounts. They don't usually spend it."

"Except for Vreeblemeyer!" I shouted. "And *he knows we can't touch him!*"

"That seems quite likely," Vogel conceded. "But, beyond continuing the monitoring, and passing the information on to you, there is very little I can do—that anyone can do."

The damnable thing was he was right.

* * *

Computers are wonderful things. They will do whatever they are told. Tell one to let a kidnapping weasel keep his money and it'll salute and stand guard. Tell it you want to see every dime he withdraws the moment it happens, even if the computer itself is preventing his capture, and the idiot machine will grin and tell all.

Get the office hacker to patch the right links, and hook up the right hardware, and a nice little terminal/printer in your office will spit out every transaction around the world, as it happens. The crummy machine sat in the corner of my office, and every day or so it would spring to life and churn out all the particulars of another withdrawal. If you want frustration, be a cop who's alerted in near-real time every time the crook he's chasing collects some of his ill-gotten gains. I started to think I was *entitled* to another heart attack, but no such luck.

After the initial flurry of movement, Vreeblemeyer slowed the pace a bit, staying in each town a week or so, moving all over the country. I had half expected Vreeblemeyer to make for the Canadian border, but he stayed in the States. Smart move, most likely. The U.S./Canada border might be three thousand miles of Swiss cheese, but it *is* a border, and some Customs clown might actually look at the passport. Not worth the risk. The best place on Earth for not getting found is the good old United States. Other places are much tougher. Just by way of example, the Germans require you to register with the police every time you move. We cops in the States are lucky if we can get the

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phone company to give us a listed phone number.

What drove me bananas was that he *had* to know we'd be watching that account. We had learned he used to work in a Swiss bank. He knew the law. He knew we were pointlessly tracking his movements through his withdrawals. *That* must have given him a feeling of power, the cops tracking his every move and unable to touch him.

Oh, Vreeblemeyer had done his homework, all right. He knew Switzerland was the best place to hide money, and the States was the best place to hide a crook. And he was safe, with the whole country to hide in. Hell's bells, he'd have been safe enough just staying in New York City. I checked at one point, and just in this city there were no fewer than twelve thousand ATMs he could draw money from. Christ, he could have used the one across the street from my office, and be over the horizon in the five minutes or so it would have taken the transaction report to be routed back to my office terminal. See, the ATMs were only half the key to making his racket successful. Speedy mobility was the other half. With enough money, he could be anywhere in the country by the time the cops got after him.

On the bright side, the FBI finally took an interest in the case. In fact, Vreeblemeyer would have made the Most Wanted list, except no one wanted to give other kidnappers ideas. But the FBI arranged to get the same real-time reporting from the Swiss that I got. Whenever Vreeblemeyer hit a new city (he stayed clear of small towns) the local FBI field office would go to work, searching for a bald man who spent only cash. They never got too close, but two or three times they did get on his trail after it was cold. And that was valuable, because they found out he was spending the cash like a drunken sailor. The best hotels, the best restaurants, the best stores, the best call girls.

I had worried that Vreeblemeyer was withdrawing his funds and shifting them to another account we didn't know about, or making some other investment for future reference—but it seemed that as soon as the bread went out of the ATM and into his pocket, it burned a hole right through and into the local economy. In a way, it made sense. Vreeblemeyer had spent the first two-thirds of his life being prudent, orderly and cautious. It must have taken years to plan and research this scheme, and endless patience waiting for the state of banking technology and Swiss banking law to reach the precise conditions the plan required. After all that, why *not* cut loose? Besides, most investments would give us something to track him with.

Banks are required to report large cash transactions, so he couldn't wander in and start an account somewhere by depositing fifty hundred-dollar bills. We'd sure track any e-fund transfer out of that account, and most non-cash investments have to be *kept* somewhere. For example, the FBI watched for cash purchases of real estate once he hit a given city. If he had bought a house, they'd have spotted it and we'd know where to find him. And you can't safely travel with portable valuables like art or gold or jewels—especially if professional ladies are in your room every night. So he might as well blow it all.

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In a way, *that* was the safest, most sensible thing he could do.

I felt I was getting to know this guy. I could almost see him as he was when he was cooking up the plan, sitting at his solitary clerk's lunch at some stolid café in Bern. The plan made for a wonderful clerk's vengeance: using the bank that had turned him into a friendless nonentity to score back at all the rules and authorities in the world, all the rich people whose money he had seen and touched every day of his life for years but could not have. All of a sudden *he* would have power and money. And there was no reason, in his orderly plan, not to spend and spend and spend. There were even several reasons *not* to be careful.

I could see him carefully considering that point among many, weighing the pros and cons and deciding he deserved as much self-indulgence as he could buy, even as he drank his one frugal cup of tea and nibbled at his dietetic sandwich. After a cheerless past lifetime of rainy days, he wasn't about to save anything for future ones.

It was nice psych-profile stuff, but that information did us very little good in the short run. So long as Vreeblemeyer used assumed names and developed some phony IDs (which the FBI was able to establish he did), he would be as safe as in his mother's arms. He could be anywhere, any time.

It doesn't take that long to spend a quarter of a million, if you put your mind to it. I watched his balance decline precipitously as the months went by. I had gotten used to his withdrawal habits. He had settled down to a pattern of withdrawing about a thousand bucks every day. (That sounds like a lot to spend until you consider that the FBI estimated that a bit more than half his spending went toward paying for first-class hotel service. Christ, even so, it *still* seems like a lot.) It was in St. Louis that all hell broke loose.

I had expected him to try and stretch the last of his dough, make it last. But Vreeblemeyer was always full of surprises. In a three day period, he bounced all over St. Louis and environs, and yanked $50,000 out of his account, leaving just a lousy five grand behind —mere chump change to Vreeb.

And then he vanished. No more transactions showed up. No activity at all in his account.

It was tempting. Very tempting to think that he had decided enough was enough, that he was retiring undefeated. But I couldn't buy that. I had gotten the idea, at the back of my skull, that Vreeblemeyer wasn't the kind of guy who could win so big after a lifetime of being a nobody, and then just fade away. He'd be back.

Besides, if he was cashing in his chips and heading for the showers, why leave five grand behind? That was what really nagged at me.

I got my answer a month later. The terminal lurking in the corner of my office suddenly sprang to life once again, first to report a $250,000 deposit in the form of an e-fund transfer from a bank in Seattle, and then to report a balance inquiry. It was the bad news I hadn't quite been willing to expect. Vreeblemeyer hadn't quit. He had just withdrawn a large enough stockpile of money so he could live in the style to

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which he was accustomed while staying in one place long enough to plot another kidnapping. If he had been pulling money out during the month he had cased Seattle, we would have had time to get organized and track him—through the hotels, for example.

I was on the horn to the Seattle cops in ten minutes—and they were plenty surprised to hear from me about a case they had only been working on for eighteen hours. I brought them up to speed plenty quick on Vreeblemeyer. Sure enough, they had come up against a carbon copy of the Smith kidnapping, down to the 3-D Polaroid of the blindfolded victim, down to the balance inquiry from an ATM miles from where the victim was held. And *they* couldn't do anything about it, either.

That was the *real* beginning of the nightmare. Now we cops were not only alerted every time this creep withdrew money. Now we could predict, to within a day or two, when a kidnapping would be committed, simply by monitoring his balance and withdrawal patterns. We just couldn't say *where* it would go down, or *who* would be the victim. Lovely.

So New York was first, then Seattle, San Diego, Minneapolis, Kansas City—I could go on, but even now it's just too damn depressing. Always a quarter million. Always the 3-D photo, always the call twenty-four hours after the boost, always the balance inquiry at an ATM far from the hide-out and then the release of the victim, dazed but unharmed. We cops still managed to keep the name Vreeblemeyer and his new technique out of the papers, but even that couldn't last. Sooner or later, someone else would get the same idea, or else hear about Vreebelemeyer and play copycat. Either way, there was the potential for *two* of these creeps to be wandering around, living off the ATMs. Or ten. Or fifty. There was simply no way to stop it once it started. The Swiss were no help. They showed exactly no interest in changing their laws. Our piddling little kidnapper was no affair of theirs.

I went through two years of that hell. Overall, I'd've rather spent the time at the dentist. Getting root canals done. My ulcer got worse, I developed a twitch under one eye, and the doctors were prescribing more and brighter-colored pills for me to take. I jumped out of my skin every time that terminal chattered out one of its cheery little messages of another transaction.

The worst was whenever he came through New York, which was fairly often. I hated it. The bald-headed little geek was in *my* town, and I couldn't find him.

I would lie awake nights, trying to come up with some way of nailing the little bastard. By now I had gotten real educated in the ways of the ATM nets, banking rules, and financial programming in general. What it came down to was that, short of shutting down the entire national ATM system, or posting a guard on every ATM, there was no way to prevent one particular user from getting into the system, so long as his home bank account was in good standing. The system was deliberately decentralized and locked-out to *prevent* government snooping and control. There weren't any technical answers.

There weren't any answers at all.

* * *

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Not until the bright day dawned in Toledo, Ohio, when Vreeblemeyer noticed his account was just a bit lean. Vreeblemeyer went to work, going from one ATM to another, pulling down a thousand bucks at a go, stocking up on the cash he would need to get by on while he planned his next job.

I swore and kicked my chair across the room and snarled at the terminal when it started reporting the withdrawals, one after another. I stomped over to my wall calendar and glared at it. The date was May 15. I flipped to June and circled the three-day period of June 14-16. Vreeblemeyer would strike again, sometime in that time period. Between now and then he'd pick his new city, pick out a hotel to stay in, find a place to lock up the victim—and pick out a victim. He'd live off his present cash supply until then, and live well, whooping it up even as he decided who to blindfold and hold at gunpoint this time.

The pattern was exact. He must have *loved* that, twitting the police, letting us know when he'd strike. The only change in the pattern since the first time was that now he left far less money in the account. This time, he only left a grand behind—barely carfare for Vreeblemeyer. It was a sign of increasing confidence, I guess.

But this time, a month later, there *was* a change in the pattern. A big one. On June 13, Vreeblemeyer took five hundred bucks out of an ATM. A New York ATM. A BankAmerica box on Amsterdam Avenue.

That set alarm bells off in my head. Five hundred bucks, out of a New York bank. He almost never took less than thousand—and here he was with only a five-hundred-dollar balance showing. And it was a very risky thing to do—it told the cops where he was. There was only one reason to take that kind of chance: He was short of cash. He was here, and he was broke.

I began to get an idea. Idea, hell. I upgraded it to an inspiration, an exciting one.

It was beautiful, perfect, poetic justice I dreamed up. Provided the little weasel made his move. *That* was the part I sweated most. I shouldn't have worried. The next day, June 14, a kidnap call came in. In New York City. In the Village. It *had* to be our boy. After all, with only five hundred bucks in the account, he needed the work.

The husband was the victim this time. Call the couple the Joneses. I set a personal driving record getting to the Joneses' apartment, a nice third-floor loft, eight minutes after we got the call. I nearly bounded up the stairs to get up there, my files all shoved into my ugly old briefcase, the light of the first hope ever for this case shining in my eyes. Mrs. Jones, a tall, slender, cool, self-assured woman, saw that in my eyes first thing. She must have wondered at first why I seemed happy that her husband had been scooped up. "Mrs. Jones," I said. "There are some things I need to tell you. With your help, we can catch the man who took your husband." And I breezed right into my pitch.

Oh yes, it was a sales pitch I gave, all right. I should retire and go into selling timeshare condos. Less than an hour after the nab was discovered, I told her *who* had taken her husband. I showed her Vreeblemeyer's picture. I told her

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what the 3-D picture of her blindfolded husband looked like before she could tell me there *was* a picture. I told her when the call would come in, what Vreeblemeyer would say, how much ransom he would demand, how he would want it paid. I told her about Swiss bank laws. I had the complete transaction records for Vreebelemeyer's account, right down to the present day.

And then I sprang it on her. My big idea, my risky idea, my roll of the dice. And she bought it, God bless her. She agreed, and called her bank to ease my way. An hour later I was in the bank president's office, going over the whole pitch again—this time giving special emphasis to the potential threat to the integrity of the whole banking industry. And *he* bought it too, agreed to cooperate. It was a beautiful morning.

A few more phone calls, and it was all set. Nothing more to do but wait it out.

Back to *chez* Jones to be with the wife, keep her from getting jumpy and changing her mind. We didn't waste time with any of the super-duper electronic equipment on the phone this time. None of it would do any good anyway. I had a pocketphone with me, that was it. We'd catch him my way, or not at all.

The day passed. Night fell. I caught a few winks in a chair in the Joneses' living room, but I was still too nervous and excited to sleep properly. I *knew* that the call would come at nine A.M., and that there was no point to sitting up, but I couldn't help it. Mrs. Jones sat up with me. She lit up a Marlboro and the next thing you knew, I was puffing on my first cigarette in twenty years. Screw the doctors. I needed it.

Precise as a goddamned Swiss watch, the call came in at nine. I watched edgily as Mrs. Jones answered it, listened, nodded, agreed to pay the money, noted down the account number I knew by heart, and hung up the phone.

I looked at her, hard; two years of being yanked around by Vreeblemeyer telling me to keep my mouth shut. But I had to say *something*. She had the right to opt out. "There's still time to play it straight, Mrs. Jones. I don't think there is any additional risk to your husband—but if you're worried that my plan might harm him, we'll cancel."

She looked me in the eye and managed a smile. "No, that call convinced me. You knew what it would be, almost word for word. I want you to *get* that bastard. Besides, if we don't stop him, plenty of other people will get hurt later on. If we could ask my husband, *he'd* say go for it. Two hours from now, I'm sure we *can* ask him. Go ahead. Call the bank."

I picked up the phone, called, got through to the bank president, and gave the prearranged instructions. I put down the phone. A few hours from now, we should have our man. Unless something went wrong. Then Mrs. Jones might be a widow. But I didn't want to think about that.

More waiting. Between the two of us, we got through another pack of cigarettes. I paced back and forth, checked out the window a dozen times to make sure my unmarked car was still there. Mrs. Jones was starting to get a little wild-eyed.

My pocketphone bleeped and I

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snatched it out of my pocket so fast I nearly tore out the lining. "Vinlander here," I said, my heart pounding.

"Flattery here. We've got the balance query, Lieutenant. It showed the deposit as having been made. A FirstBank machine on Amsterdam Avenue."

I dropped the phone back in my pocket and smiled at Mrs. Jones. "Vreeblemeyer has checked the account and seen the ransom money in it. Your husband should be free soon."

"Thank God."

That was square one. Square two came within the hour when a much-frazzled Mr. Jones staggered out of his makeshift cell on West 81st street, hailed a cab and rode it home. I got to witness the tearful reunion, but my mind wasn't on it. Jones was okay, fine—but Vreeblemeyer was still on the loose.

I said good-bye to the Joneses, went down to my car and headed north toward the upper west side. Vreeb had done his balance check there. Jones had been held there. If Vreeb was money-hungry, he wouldn't go far from there before trying to collect.

Vreeblemeyer was short of cash. *That* was the key to my whole plan. Why he was short, I didn't know. Maybe he'd played the ponies and lost more than expected. Maybe he'd been mugged. Who cares? By this time he had to be a money junkie, hooked on having lots of the stuff. For him, being short of cash would equal desperation. And desperate men hurry, they cut corners, they make mistakes. He had made a goof already. Scooping money the day before a hit, letting us know what city he was in, giving me time to plan. That was slack.

Maybe he'd make more mistakes. Always before, he had used a machine miles from the ransom victim to do the balance inquiry. Maybe not this time. Maybe he'd be too rushed to get his cash fix, too overconfident that he had the police under control. That was *my* betting—but my deal with the Joneses' bank president was ready to hedge the gamble, slow him down enough for the terminal in my office to tell us where he was in time for cops to get there. If we could slow him just enough—Flattery was watching the terminal, with a direct line to the dispatcher by his side. A call from him and the closest five squad cars in the vicinity would be radioed in. If they missed him—well, maybe we could stop him cold even if we didn't get there in time.

Suddenly, the car radio squawked to life. "All units in vicinity. Proceed on silent approach to automatic bank teller at 788 Ninth Avenue and apprehend subject using it or in vicinity. Description follows—"

I missed the rest of it as I slammed on the accelerator and shot through an intersection just as the light was changing. I was only a few blocks away, and I wanted to get there first. I swung onto West 55th, then turned left into Ninth, a block or two uptown of the ATM. I spotted the ATM with someone standing in front of it and grinned. I pulled my car over and double-parked on the far side of the street. The figure at the ATM didn't notice me. And I was there first. I grabbed the car's radio mike. "All units responding to 788 Ninth. Seal off area, do not approach. I have him." I tossed the mike down and got out of the car. I wanted this one myself.

I looked again at the guy at the teller

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machine, and my heart skipped a beat with joy. It was him all right. Vreeblemeyer. Even from the rear, and across the street, I recognized him. Fatter than in the photo I had of him, a bit less hair, garishly dressed, but him.

And he was cussing and shouting at the top of his voice, pounding on the ATM machine. A sweet sight to see. I grinned hugely and sauntered across the street toward him, savoring the moment.

"Having some trouble?" I asked pleasantly, one citizen to another.

"This machine!" he sputtered in his slightly accented voice, without turning from the teller. "I have tried twice and it refuses to give me my money."

"Try it again," I suggested. "Sometimes these boxes are a little finicky."

"Yah, yah," he muttered testily and shoved the card in again.

"And then, sometimes," I went on casually as the card slid into the slot and he frantically punched in his withdrawal request, "the machines refuse to pay out for some good reason—say you're going to collect on a fund transfer that's been credited but then turns out to be no good when the receiving bank computer checks with the sending bank. The electronic version of a bounced check. Probably the first one in history authorized by an honest bank president."

Vreeblemeyer turned to look at me in slowly dawning horror. His eyes were bloodshot, and there was a yellowish tinge to his skin, a touch of jaundice. Two years of wild good times and too much booze were getting to his liver. Well, he'd get a rest cure now. Suddenly, he realized the full import of what I was saying and turned back to the ATM. "No!" he shrieked. "It's my money! My money!"

"Usually," I went on, "the machine lets it go the first two times and just rejects the request, in case you've made a mistake keying things in. But some of those banks, especially the Swiss ones. Real sticklers for the rules. With them, the *third* time—"

He looked at the ATM's read-out screen and howled.

YOU HAVE ATTEMPTED
WITHDRAWAL OF
UNAVAILABLE FUNDS BASED
ON A FRAUDULENT DEPOSIT.
YOUR BANK CARD HAS
THEREFORE BEEN REPOSSESSED
AND YOUR BANK CARD
PRIVILEGES REVOKED UNTIL
THESE DEBTS ARE MADE GOOD

He screamed in anger and horror, and clawed at the screen.

"—The third time," I went on smoothly, ignoring the interruption, "it kidnaps your card and holds it hostage. The machine's got your card, Vreeblemeyer, it's holding the thing for ransom, and I don't think you can pay. Take it from me, *nobody* sticks closer to the rules than a Swiss bank. I ought to know. You're nailed, Vreeblemeyer." My voice dropped. I made it low and grim, but still there was a note of triumph in it. What the hell, I deserved it. "No point in running away, either. Without that card, you're nobody." He let his arms drop to his side, slumped against the machine that had cut off his lifeblood, and nodded in dejected agreement. I slipped on the cuffs and tried to keep from dancing a jig as I led him away.

A beautiful morning.

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* * *

When we had Vreeblemeyer and had put him away for nine million years or so (okay, six consecutive life sentences. Comes to the same thing, if you think about it), that made all the difference. We could show that ATM kidnappers got caught, make Vreeblemeyer look like a fool instead of a genius in the press. ATM kidnapping wasn't a successful crime anymore. We could go for publicity, and the heat of that publicity was enough to force the Swiss to change their laws. Even enough to get SuisseBank to remunerate all the other kidnap victims and avoid the image of a passive accessory to criminal acts. *That* was the best part for me.

Take it from me, you just don't know what satisfaction is until you can jerk banks around. Until you can work the rules to beat the system that's driving you batty. *That's* pleasure.

Look up Vreeblemeyer at Leavenworth and ask *him* if you don't believe me. *He* ought to know. ■

ON GAMING

(Continued from page 65)

game board locations, getting information, commissions, and even allies to help them in their campaign. The locations are filled with assorted weirdnesses, and it's fun to go places just to see what happens.

Unfortunately, each turn can bring a new gate opening, and an investigator can find him or herself entering one of the strange realms of H.P.'s feverish imagination.

There's the Abyss, the City of the Great Race, the Dreamlands, and the Terrible Sunken City of R'Lyeh. You spend two turns in such a location, losing sanity points and strength, but sometimes gaining a useful item to fight the creatures of the mythos.

The object of the game is to close all the gates—not an easy task—and the game is best played cooperatively with a number of players and investigators (which also happens to be the only way to survive in a game of *Call of Cthulhu).*

While very much more lighthearted than the darkly grim role-playing game, *Arkham Horror* is the successful entry in the all-too-small category, the horror board game. There's only one game that's been more successful—*Nightmare House,* a TSR/SPI magazine game that is, perhaps, a lost classic. But *Arkham House* will give you a rousing time fighting the overwhelming forces of evil that seem to infest the town of Arkham. ■

● The simplest schoolboy is now familiar with truths for which Archimedes would have sacrificed his life.

Ernest Renan

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Jay Kay Klein's biolog

William Warren sort of accidentally stumbled into becoming an illustrator for *Analog* when asked by longtime friend John Cramer to do some illustrations for his science column. The sort of guy with a background more associated with an *Analog* writer, Bill made a big hit with editor Dr. Schmidt. By no coincidence Bill has been a reader of *Analog* since childhood.

Analog was one of the few constants for an army brat moving from one town to another. Never really having a home, he had to live in his head and carry his culture with him. Childhood explorations of Hawaiian tropical rainforests have probably prepared him for recent years in Washington State. And a life long exposure to military weapons systems has provided him with the same acceptance of technology that a Mohawk Indian has of heights.

As a child it was people he had trouble with, trying to mingle with provincials who hadn't traveled as far as the next town, let alone been places where it helped to know "pidgin." With his dad posted to Vietnam, he got bundled off to the middle of Kansas as a high school sophomore, leaving science fiction as the only bright spot on an endless horizon of wheat. Bill grew tall pretty quickly, reaching 6'2" though never weighing more than 145 pounds.

A letter to NBC complaining about their mistreatment of *Star Trek* brought him in contact with SF fans via a personal note from Gene Roddenberry. Bill started writing stories and doing illustrations for SF fan magazines. The University of Oklahoma followed for just two years, on a Navy ROTC scholarship, with a major in writing and a minor in cinematography.

Through his continuing artwork and interest in SF, he met Robert Heinlein, Harlan Ellison, and especially *Analog* cover artist Kelly Freas.

Experience acquired as art director of a small, struggling international business magazine led indirectly to his first oil painting and published color work—the cover of the 1978 world SF convention program book. When John Cramer became an *Analog* columnist, it seemed natural that he would ask Bill for illustrations.

Bill works like the archetypal teenager, on a living room couch with VCR running, people gabbing, and various other stimulations that most would consider distractions. Like all the best artists in science fiction, he first researches the background, using an incredibly varied personal reference library supplemented by the public library, thus becoming self-educated in everything. He has found SF readers incredibly demanding of accuracy, or at least plausibility, and each illustration he does is as carefully thought out as something designed by an engineer.

That's for fun. His current nine-to-five job is assistant art director for the Motion Picture and TV Unit of Boeing in Seattle. There, he works on video and film production showing the cutting edge of aerospace technology. As you might expect, he first tries out ideas on a computer graphics screen, the electronic paintbox helping him to make real that which doesn't yet exist. ■

William R. Warren, Jr.

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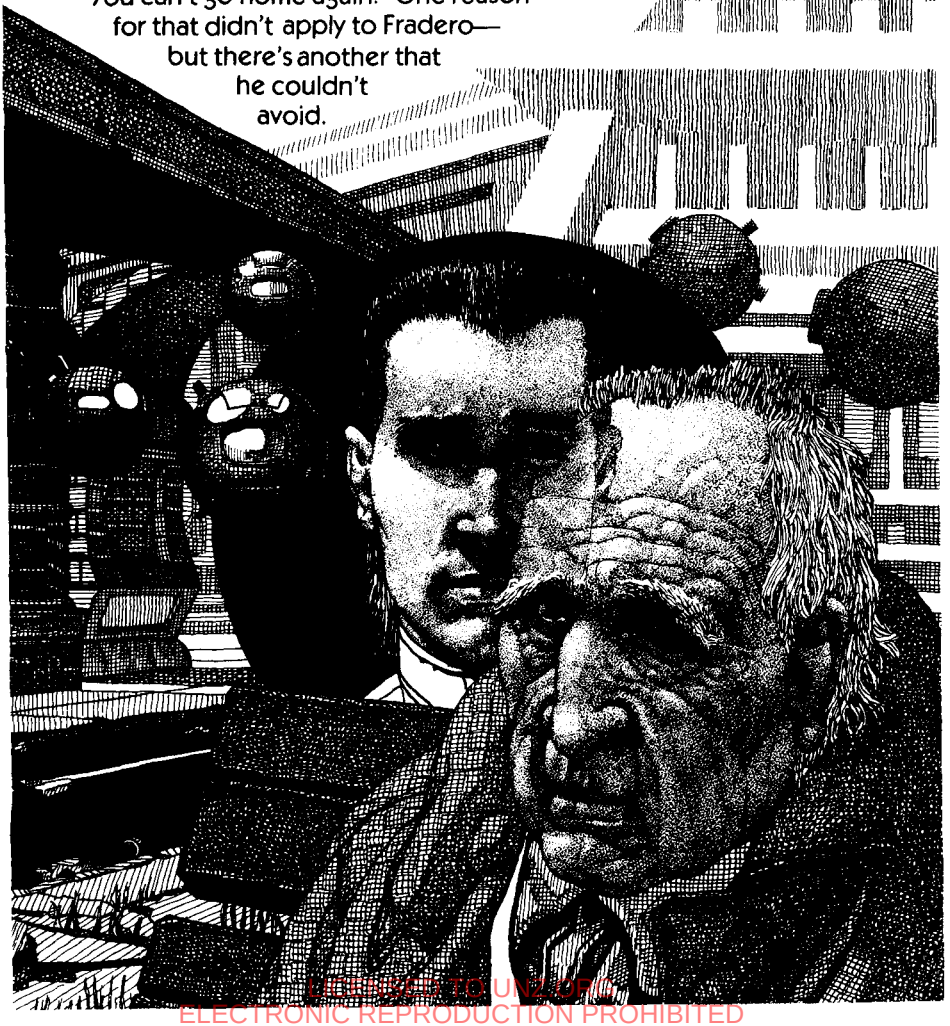
FRADERO GOES HOME

Kevin O'Donnell, Jr.

There's an old saying that, "You can't go home again." One reason for that didn't apply to Fradero—but there's another that he couldn't avoid.

Janet Aulisio



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Franklin Delano Roosevelt Nikolaites came home hurting, both in his body and in his mind.

He had lived fifty-two years (experienced years, they called them) in the space of one day (a universal day, they called it). He had done it to make money, to defend human civilization, and to learn all he could about the civilization he was protecting. In pretty much that order of priority.

He had succeeded.

He had earned (net of all withholding taxes) a few dollars over a million.

He had prevented seven plague-carriers from reaching Earth in the infectious but asymptomatic state.

He had studied the history and the geography of his planet, the science and the art of his culture, the politics and the economics of his country. He understood the world into which he would retire better, perhaps, than anyone alive.

Seventy (experienced) years old, returning to the town where he had drawn his first breath eighteen (universal) years ago, Fradero hurt, in both his body and his mind.

A cloud of newsdrones, gnat-small when viewed from three blocks away, danced around his father's house. He sank back against the taxi's seat, anticipation curdling into bitter, helpless rage—at them, and at himself, for having forgotten just how persistent they could be. *Goddamn them!*

For weeks he had dreamed of being home again, of sheltering within those familiar walls while readjusting to a world that once more aged at the same rate he did. He had wanted so badly to reenter the world through the doors of that neo-Victorian dwelling that even when the newsdrones chased him from the Web Station, he had assumed they would grant him sanctuary at home.

At least he had seen the newsies before coming in range of their ID readers. Now if only the taxi could change tracks in time—

He ducked below window level. "Don't stop." He kept his voice low; the cab's magnetic-levitation propulsion system made so little noise that despite the distance the drones' mikes might identify him. "Just take a left here and go directly to Yale-New Haven Hospital."

Eyes closed, head bent, he bit his lips. He had planned to shower in the tub with the torn curtain, nap on the bed where he had spent half his youth, and catch a snack at the kitchen table into the edge of which he had once, oh so foolishly, carved his initials. The old man had thumped him for that one. . . .

Now he would have to forego decompression. He could live with that, though. Thanks to his hard-earned wealth, Yale-New Haven was giving his younger brother Abe the new treatment for Byskan plague; their father would be pacing the waiting room, overdosing on hospital coffee, and snarling at anyone with the temerity to tell him not to worry.

The cab sped through uncrowded streets. Nikolaites peeked out a window. Boarded windows and shuttered shop doors marked the holes that the extraterrestrial plagues had torn in the city's ranks. Tears stung his eyes, and he had to wipe them with his handkerchief.

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Another flock of drones awaited him at the hospital. "Damnation."

"Sir?" said the cab's electronics.

"Don't slow down, just keep going. . . . Would it be possible for you to drop me at Sterling Memorial Library, and then take my bags home for me?"

"Yes, sir. What is the address of home?"

"12 Saint Ronan's Place."

The numbers on the meter flickered. "That will be your final fare, sir. Will it be cash or charge?"

He patted his pocket. He had less than fifty dollars in cash, and might need them all for unchargeable, and hence, untraceable necessities. "Charge, please."

"Your ID account or a bank card?"

"ID account, please."

The cab's ID reader made a small sound, like a very soft purr. "Please place your thumb on the scanner for ID verification, sir."

Nikolaites obliged. A few moments later the cab stopped in front of Yale's time-worn main library, and Nikolaites got out painfully. "Thank you, driver," he said as he closed the door.

A hologram in the window of the right rear door flashed, "You're welcome! Have a nice day!" The cab rode the rail back into the sparse, silent traffic.

Nikolaites began walking away from the library at as rapid a pace as he could set. Any good newsie could pop a cabbie's log from a hundred meters, and he wanted to reach the New Haven Green before the first drone spiraled down to the stone lions flanking the library steps.

* * *

"Arthritis," he said, "is how the Earth must feel when a coal mine catches fire and nobody can put it out."

"Fill it with dry ice," said the solemn seven-year-old on the park bench beside him, "cram it all the way to the top with dry ice, and that'll put out the fire."

"I suppose it would." The breeze picked up; he swallowed hard, fighting the fear of gusts that fifty-two years in an artificial environment had made instinctive. The sun felt good, though. Very good, to one returned from far beyond Pluto. And why not? The skin on his flesh, and even the bones within, represented millions of years of adaptation to that sun. "Of course, you can't really do that with knees and ankles."

"Or with coal mines, either," said the child. "It's too expensive. You know how much dry ice you'd need to fill a coal mine? A lot."

"That's right."

A pigeon silly-walked up to them and pecked the pavement at their feet. The kid nudged Nikolaites. "Look!"

"At the pigeon?"

"Yeah. How come it's doing that?"

"I would assume it's because some people sit here and feed them. In time, they learn that if a human's sitting here, there might be food at the human's feet. So they come over and inspect the premises, so to speak."

"You think maybe it's trying to tell us it's hungry?"

"Pigeons," said Nikolaites, "are always hungry."

"How do you know so much about pigeons?"

"The same way you know so much about coal mines."

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"How's that?"

"I make it up as I go along."

"Oh." The child thought on that for a moment. "Yeah. Me, too."

A woman approached, flustering the pigeon into reluctant flight. She flashed the child an aggravated glare, and asked, "Is he bothering you?"

"Not at all," said Nikolaites, "I—"

"I was talking to my *kid,* mister." She grabbed the boy's hand. "Get away from there." She pulled him off the bench. "How many times do I have to tell you? Come on!" She half-led, half-dragged him away. "Did he offer you candy? Did he touch you?"

Nikolaites closed his eyes. *This* was the world he had given his life to defend?

The boy said, "No, ma, why would he?"

"Never you mind, just get away from him, dirty old man, don't you ever let one of them get you. . . ."

Nikolaites attributed her hostility to xenophobia, to fear of contagion, to the maternal instinct, and of course to the ever-rising incidence of child molestation—though a variety of studies pointed more toward an ever-rising incidence of *reporting* child molestation, not that dry statistics offered a great deal of comfort to a troubled mother.

Still. An old man, sitting on a park bench, did not deserve to be regarded as a criminal simply because he was an old man, sitting on a park bench . . . did he?

Well, one could make a convincing case that since the unemployed committed, on a *per capita* basis, more and greater crimes against the person than any other demographic segment, the harsh light of suspicion should always fall on the demonstrably unemployed.

And never mind that nonsense about "innocent until proven guilty."

A light tap on his left shin popped his eyes open.

A teenage girl stood before him, hands on her chain-wrapped hips, a scowl on her pimpled face. The front of her T-shirt displayed a series of holographic images, mostly of teenage boys who, presumably, had also been on the inside of the shirt. "Hey, Gramps, you sitting my bench!"

He blinked. A twipper. He had expected to be accosted by one, sooner or later—they haunted the public areas of the central city. Mostly female, rarely violent, they enjoyed the theater of intimidation, and extorted cash from anyone who preferred not to play the odds. "Isn't this the New Haven Green?"

"What, you so old you forgot?"

"Is that what you think?"

"I think you sitting my bench, that what I think."

He gestured to the unoccupied half. "Have a seat, then."

"What for?"

"Or don't, as you prefer." A new face coalesced on her T-shirt. Though he considered it impolite to scrutinize a young woman's torso, something in the holo's dark brown eyes tugged at his memory. "Who's that?"

She glanced down. "Jimmy Nguyen. You know'm?"

"Jimmy Nguyen!" The name sparked bright in his mind, flashed as strong as the white, even teeth of the holoface —then, curiously, illuminated nothing. Did Nikolaites once know that smiling, suntanned teen? Or was it only the sur-

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name. . . . "Ah. Our next-door neighbors were named Nguyen; they owned a car, though."

"So?"

"It was an antique—internal combustion, wheels, and only the most primitive of microchips in the engine."

"Yeah, yeah. Forget you owe me rent, old man?"

"My dear lady, you owe me rent. On your life." He was enjoying this, and suspected she was, too. "Were it not for me, you would die seven times over. Now, I have no idea what your life is worth, though I can assay a fairly shrewd guess as to your hourly rate, so let us simply call it even. Does that strike you as fair?"

She nearly smiled, but caught herself. "What that you say?"

He struggled to recollect a bit of twipperspeak. "What I say, girl, is this: A copdrone bumbling here to speak you up right now. You move quick, you don't *have* to overnight the metro motel."

She looked over her shoulder, saw the remote-controlled police surveillance unit, and fled without another word.

The antigravity-driven plastic ball made no attempt to give chase. Rather, it floated to Nikolaites, rolling a bit to point its cameras and ID reader at him. "Would you like an escort home, sir?"

"No, thank you officer, I'm fine."

"Sir, this is twipper territory."

"Yes, officer, I'm aware of that."

The unit rose a couple of centimeters, and fell back. An expert controller had just shrugged. "As long as you don't mind the harassment, sir."

"I don't, but I thank you for your concern."

"No problem, sir, I—" The voice tensed. "Stand up very slowly, please."

"It's the only way I can stand up," he said as he complied. "Before you do anything rash, though, may I suggest that you read a little further in the file on your screen?"

"Sure. You clasp your hands behind your neck, and I'll— oh. That really is your own ID, isn't it?"

"Yes it is, officer."

"How'd you, um, you know?"

"Four years at the Academy and forty-eight years on Quarelay Station. Experienced years, that is. One day, universal."

"Geez."

That seemed to require no comment, so Nikolaites made none.

"Was it worth it, Mr. Nikolaites?"

He looked beyond the pseudo-Gothic of the Yale University buildings, to the towers of the Yale-New Haven Hospital, which would have refused Abe the new treatment if Nikolaites had not earned that million dollars. "Yes," he said slowly, "yes, it was."

"I don't think I'd have the courage." The ball swung from side to side, for all the world like a person shaking his head. "Well, back to the beat. You be careful out here, now."

"Oh, I will. Good day, officer."

The drone hummed off. Nikolaites waited till it glided past the ancient elm near the College Street bus stop, then hurried in the opposite direction.

The newsdrones rode the copdrones like remora rode sharks. The law made any police activity a matter of public record; when a cop checked a citizen's

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ID, the citizen's name and the location of the check also became public knowledge.

And with over a thousand media-mongers in town for the express purpose of interviewing one Franklin Delano Roosevelt Nikolaites, a.k.a. Fradero. . . .

His knees and ankles burned with every step; the July sun, a friendly relief to an old man sitting on a bench, became an enemy. He panted, wishing he could move more quickly without appearing to be in flight.

He did not move quickly enough.

"Mr. Nikolaites!"

Gritting his teeth, swallowing a curse, he bent his head and kept on.

A newsdrone dropped out of the air to bob before him. "Raphael Faubourg, Mr. Nikolaites, from WNHT News, and I have just a couple of questions for you—"

Feigning a hearing impairment, he leaned forward, turning his head and cupping his left ear with his left hand. In the meantime, he dug into his right coat pocket for the plastic shopping bag. "Eh? Speak up."

The device drifted to within five centimeters of his ear. "Mr.—"

He whipped the bag out of his pocket, over the drone, and pulled the drawstring tight. Then, leaving the blinded ball hanging like a balloon tethered with transparent line, he hobbled away, turning up his coat collar and ducking his head. It made him look conspicuous, this imitation of a man braving a blizzard in the midst of a July heat wave, but it obscured his features, and he needed that.

A hand touched his right shoulder. "Mr. Nikolaites."

He had to stop. A shame the shopping bag trick would not work on a human being. "What?"

A young man, twenty-five, maybe thirty, with a slender build and a racing stripe shaved through the middle of his auburn hair, smiled uncertainly. "You are Frank Nikolaites, aren't you?"

"And if I choose to deny it?"

"Sir, I've been looking all over town for you—"

"You and a thousand others," he said grumpily. "Why do you refuse to accept the fact that I do not wish to speak to the media?"

The young man blinked. "I'm not media; I'm English."

"I beg your pardon?"

"Oh, my." The man blushed. "I mean, I'm in the English Department, not the Media Department. At Hillhouse High. Your brother Abe was in my class, and actually, you and I met, uh . . . very briefly."

Nikolaites stared into the man's face, searching for anything that would jog his memory. Freckles, delicate skin still pink with embarrassment, strong nose, worried brown eyes . . . nothing evoked a name or a place or a time. "Where did we meet?"

The man winced. "At the funerals. I represented the school—I'd worked with your mother on the PTA. And I knew Abe, of course. I introduced myself, but you, uh. . . . Look, I'm sorry, I didn't mean to bring up painful memories."

"They're not. Not anymore. Poignant, perhaps, or wistful, but they cause no pain, not after so many years.

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Experienced years lighten pain as well as universal years." Nikolaites continued to regard the other carefully. "So you knew my mother?"

"Yes. Not very well, but enough to . . . I really liked her."

Nikolaites nodded. "What did you want, Mr. ah—?"

"Sontimargo, Will Sontimargo. And I'd like to ask for your help." He spread his pale hands. "See, it's summer vacation, and I don't start teaching again till fall, so I'm doing research for a book."

"On me?"

"No!" Immediately he squeezed his eyes shut. "Gosh, I hope I didn't offend you, Mr. Nikolaites. It's not that your story wouldn't make a good book, it's just I'm writing fiction. What I hoped is that you could give me some insights into a Host's mind. I've got a long list of questions. For example." He pulled a memopad out of his pocket, touched a button, and squinted at its screen. "May I?"

Nikolaites decided to believe Sontimargo's story. Or rather, to accept it at face value. If nothing else, the youngster might serve as camouflage—the newsdrones were hunting for an old man, and might pass over someone who looked to be stolling in the park with his grandson. "Go ahead."

Grateful relief replaced the anxiety on Sontimargo's face. He read his question quickly, almost too quickly for comprehension. "You did your whole stint in one universal day, which is very unusual. Most Quarelay Hosts come home for at least a weekend between tours. You didn't take a single day off. Why?"

The question struck Nikolaites as fair, and not likely to compromise anyone's privacy but his own. "A large bill came due this morning, universal."

"Abe's medical bill?"

"That is none of your business." Standing still made him nervous; he began to walk toward the courthouse.

The teacher followed. "No problem. Feel free to say that to any question you'd rather not answer. Was the Bureau opposed to your working straight through?"

"Theoretically, yes. In practice, the personnel shortage at the Bureau of Customs and Quarantine is so dire that most of the supervisors' objections were *pro forma*."

"Okay, great." He looked from the memopad to the path beneath his feet to Nikolaites' face, as if unsure of which was most important. "What about—"

"Hey, Gramps, this perforhead give you trouble?" The teenage girl in the holoshirt had returned, and she had brought a girlfriend. A large one. The friend had brown hair, broad shoulders, almost no chin—and a lasersaw in her hand.

"Me, a perforhead?" Sontimargo laughed out loud. "I'm a high school teacher."

"Even worse." She stepped closer, eyes narrowed. "Gramps?"

"He's no trouble." Nikolaites smiled. "But thank you for coming to my defense."

"Twipper take care of people rent her bench."

"I did?"

"You say you save my life seven times, Gramps. We deducting your rent from my rent, remember?"

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"Yes," he said, "of course."

"Beside—" She and her friend moved to within a meter of him. "You'n me still need to clear up how you save my life seven times without I ever notice."

That was nearly the last thing he wanted to do, but he seemed to have no choice, and to confront the inevitable with grace and style had always struck him as the duty of a civilized man. "I would be happy to explain that," he said, "as long as we can find some privacy."

"Cops?" she said with blatant disbelief.

"Media."

"What, you some kind of celeb?"

"Let's find the privacy before the drones appear."

"Got a van." She jerked a thumb over her shoulder. "Go cruise'n schmooze. Autograph, too. Maybe even holo for m'shirt. Time I had a celeb. Why you famous?"

"It's a long story." He began trudging in the direction she had pointed.

"And perfor-teacher-head, Gramps?"

"Will? He's doing research. Let him tag along."

"Shit," she said. "Here I thought I cut your lead to six."

The maglevan looked like a cracked, sunfaded plastic box on wheels, but four incongruously plush reclining seats filled its rear. Nikolaites, Sontimargo, and the girl with the lasersaw took three of them. The twipper in the holoshirt strapped herself in up front and switched on the magnets. The van lifted smoothly, silently. "Belt up." She stabbed the stereo controls. "Starborough Fair" blared out.

"Please." Nikolaites cinched his seatbelt snug. "If I hear that song one more time I will surely go mad."

"This?" She glanced over her shoulder. "Brand new, Gramps."

"Yes, but— what is your name, anyway?"

"Chichimorano."

"Thank you, Chichimo—"

"—morano."

"Chichimorano. And your friend?"

The larger one with the lasersaw grinned. In a startlingly deep voice, she said, "Bunyan."

"Bunyan, Chichimorano, I am Frank Nikolaites. You may call me Mr. Nikolaites. And this person here is Will Sontimargo."

"English Department, Hillhouse High." He opened his memopad, but looked a question at Nikolaites before switching it on.

Nikolaites nodded to Sontimargo, then addressed the back of the driver's head. "Chichimorano, to you that song is new. I have heard it several times a day for fifty-two years."

"Five-two? Shit, you a fast-timer!"

"You're quick, Chichimorano."

"Twip don't equal dumb."

Bunyan nodded.

Nikolaites cleared his throat. "As I was saying, I have also heard— incessantly — the song 'Starborough Fair' and the song that that was adapted from, and the original 20th century folk-rock hit it was based on was an ancient English folk tune." He caught her gaze in the rear-view mirror. "I promise you, Chichimorano, that if I have to listen to it one more time I will destroy the stereo playing it."

"You try you die." She winked,

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turned it off, and eased away from the curb. "So why bring ol' teach?"

"Mr. Sontimargo is writing a book—a fiction book, that is. You need not worry that you yourselves will appear on-line, though a rather distorted image of you probably will. He is doing research."

"Was it lonely out there?" said Sontimargo. "Did you get homesick?"

"Lonely, with all those Guests? No. But I did miss New Haven a great deal." Nikolaites glanced out the oversized side window at the trickle of traffic on Temple Street. He frowned. From his perspective everything looked strange. "Is this a one-way window?"

Bunyan said, "Most people enjoy media attention, Mr. Nikolaites. Why are you dodging it?"

"You speak standard?"

She made a face. "So does Chichi. You have to be able to, even if you would rather speak twipper. The twipperer you talk, the less the voice-axes understand you, which makes it difficult to, say, buy a hamburger."

"I see."

"But now you're evading *me*." She set the lasersaw across her thighs and smiled at him.

He sighed. "I'm ducking them because they want me to answer questions they have no business asking."

"Like what?"

"Let me explain. For the last forty-eight experienced years, I was a Host aboard Quarelay Station, where travelers are quarantined for six months to see if they develop any of the Byskan plagues." He inclined his head to Chichimorano. "And *that* is how I saved your life seven times, my dear young lady."

"By babysitting rich folk?" She made a right turn.

"No." In the course of a blink he lost his bearings, but spotted a street sign a second later: Crown. He relaxed, and recovered his train of thought. "By watching, by interpreting sensor readings, and—on occasion—by tampering with physiological equilibria that struck me as artificial in origin. Seven of those who passed through my wing carried bio-caches containing plagues that would have devastated the planet. I arrested them. Therefore, you are alive today—or rather, given the necessary incubation periods and vectoring times, you will not die next week or next month. Not from those plagues, at least."

Her forehead creased as she tried to work it out. Bunyan, meanwhile, said, "Media, Mr. Nikolaites, media."

"In my forty-eight experienced years—the past universal day, to you—I hosted some five thousand of the richest, most powerful, most influential people in the world. Each spent at least six months as my Guest. The media want to know the intimate details of their lives. And of their deaths."

Chichimorano snapped her fingers. "Where I saw you! *MacroMicroScope*, this morn. Said you found Arvin Lee's bod." Her eyes, framed by the rearview mirror, widened. "You read his note! Why'd he do himself?"

Arvin Lee? Body? Note? The man must have been a Guest, though, which made the answer easy: "No comment." Nikolaites looked outside. He did not recognize a single one of the shops. The

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hairs on the nape of his neck rose. Where was he?

Sontimargo seized the brief silence. "You went through essentially the same cycle with every one of those hundred groups—they came in as strangers; you met them and got close to them; then they left, and a new cycle started. Has this affected the way you relate to people?"

"No more than it affects school teachers," said Nikolaites absently.

"But we go home to our family and friends every night." Sontimargo frowned. "Hey, how did the media find out your name?"

Still on Crown? He craned his neck. One arm of the holo-projected street sign said High; the other, Crown. Well, yes, all right, so next should come York—

"Mr. Nikolaites?"

"Pardon?" He stared blankly at Sontimargo for a moment, then realized the man had asked a question. "I'm sorry, I wasn't paying attention."

"How did the media find out your name? I thought your identities were confidential."

"Someone in Web corporate," he said, his original resentment rising again, "leaked the information to the media. I presume he or she received a hefty sum of money in return. Web Security is investigating, but that, of course, does me no good."

None of the buildings seemed at all familiar, but the sign they passed did say York Street. A chill settled in. He hugged himself. Was he really in New Haven? Or had these two delinquents whisked him off to—

"So what's the problem?" said Bunyan.

Nikolaites deemed it common courtesy to answer a twipper holding a weapon. "First—" He licked his lips, unable to look anywhere but for the upcoming sign, which ought to say Park Street. "—the issue of confidentiality. Guests expect that their right to privacy will be observed by their Hosts."

"You told us 'no comment,' so why not say that to the media?"

"Because the media have voice stress analyzers."

"So?"

"Exceedingly good ones." Park—but not the Park Street he remembered. Damnation! This could not be New Haven. New England cities simply do not change so drastically overnight. Yet they do share street names. He must be somewhere else—Bridgeport, maybe, or Derby. Had he fallen asleep? Perhaps they had drugged him. He told himself to calm down. Whatever the twippers were doing, wherever they were taking him, they had him, and a lasersaw, and he might as well keep the situation as affable as possible.

Bunyan said, "Good, exceedingly good, how much difference does that make?"

"A great deal." Bitterness crept into his voice. A media-quality VSA would have saved at least two lives aboard Quarelay, while the Bureau-issue equipment had proved worthless. "Permit me to explain. When you ask me a question, my brain and my body respond, even if I'm only saying, 'Go away.' Top-notch VSA's can read that response. A skilled interpreter, human or AI, can then guess the truth with a reasonable

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likelihood of accuracy. So if one puts the three together—that is, an excellent questioner, a high-caliber VSA, and a talented interpreter—why, one can see through the smokescreen of 'No comment' as though it weren't there at all."

"So what did they want to know besides the contents of Arvin Lee's suicide note?"

"Trivia!" He glanced at the alien street. Terror rose in him, but he could not acknowledge it, so he let his fear turn to rage at the media. His gnarled fingers knotted into a fist; the fist beat the armrest of his seat. "I spent fifty years studying the modern world, and what do they want to know? 'Did the evangelist use his sex toy, and if he did, which of its orifices did he prefer, and how often did he penetrate it?' "

Sontimargo scratched his head. "Mr. Nikolaites, do you even *remember* details like that?"

"Pardon?"

"Well, you dealt with five thousand people of more or less equal prominence, for roughly equal periods of time, and it seems to me that details like that would sort of blur in your mind, at least as far as the average passenger is concerned."

Nikolaites had never considered that question, and had no ready answer. "I don't know," he said slowly. "We researched the Guests thoroughly before they boarded, so as to anticipate each one's, ah, unique requirements, but once they disembarked, there was no point in reminiscing about them. For that matter, there was no time. The important facts pertained more to, ah, classes than to individuals."

Sontimargo's eyebrows quirked. "Classes?"

Nikolaites said, "For example, athletes—as a general rule—behaved more boisterously than, say, poets. Sales representatives smiled more. Lawyers tended to complain about the wine. Do you see what I mean?"

"I think so. You're saying that except, possibly, for a few extraordinary cases, you *have* forgotten these small details."

"Yes. Because I had no subsequent occasion to refresh my memory—I didn't encounter them on the street, or correspond with them, and certainly discussing one Guest with another Guest was absolutely prohibited. . . ." Trying to formulate his thought, he stared out the window. Howe Street? No, impossible, surely he would have recalled a fireworks shop . . . but the Lovedumb Cafe, he *did* remember that, so— He turned back to Bunyan. "Ironic, isn't it? I could tell the media, if they'd ask, or even if they'd just listen, the surest, most permanent solutions to the famines that sweep through sub-Saharan Africa every five or six years. Do they care? No. What they want to know is what diet the poet Tashimanu went on to lose those forty kilograms."

Bunyan blinked. "Was *he* one of your Guests?"

"No comment." He shivered. God, was he in New Haven or not? If he was, how could it have changed so much in forty-eight universal hours?

"I'm sorry." She reached across the maglevan and patted his wrist, the first woman to touch him so in fifty years. "I'm beginning to understand your problem."

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"But only beginning," he said.

She raised one eyebrow. "Come again?"

"Remember the evangelist and the poet."

"Pardon?"

"Almost by definition, if the media wish to know something about a person, that person would rather the media did not know it."

Bunyan said, "Aaah," as she nodded vigorously.

Chichimorano said, "So? You afraid Rev Randy send you to hell?"

"Not really." He said it as dryly as he could, though his teeth wanted to chatter. "He does, however, have, ah, devotees? Who might believe, with Simon Peter on Gethsemane, that a sharp sword is the best defense for one's spiritual leader."

Sontimargo nudged his arm. "Everything you're saying, Mr. Nikolaites, is pretty negative—you want to avoid the media, you want to avoid any goons who might think you'd talk, and all that. What do you want in a *positive* sense?"

"Short term?"

"Or long. Or both."

Nikolaites shrugged. "I want to see my brother at the hospital, because if the treatment doesn't work—" His throat clogged suddenly. He swallowed. Moisture filmed his eyes; embarrassed, he looked away.

"I had a brother," said Bunyan in a slow, dreamy voice. "Till the plagues. He caught CHD and went insane. The police had to shoot him. In the living room. My mother recovered from what he did to her. My father still limps."

"I'm sorry," said Nikolaites.

"Don't be," she said. "Somebody else's brother's going to be okay, thanks to you. Just my luck you weren't up there back then."

Sontimargo cleared his throat. "So you want to see your brother in the hospital, and—?"

"I also want to go home. To where I grew up. Just go there, and be there, and wallow in it. That's short term."

"Shit," said Chichimorano, "no prob on the hosp, put you there myself a sec or two."

He blinked, translated mentally, and said, "Yes, my dear young lady, but on the one hand, I would rather enter as a visitor than as an emergency room patient, and on the other, the media would pick up on my presence even if I did arrive in an ambulance."

"No ID no way." She smiled. Not pleasantly.

He regarded her mirror image with respect, and with a trace of apprehension. That smile of hers *bothered* him. She was just kidding, wasn't she? "That would be a good suggestion if I did not have to enter the Isolation, Experimental, and Critical Care Ward. Unfortunately, I do, and they will insist upon reading my ID before admitting me."

"You right." She made a face. "Damn."

"Which hospital?" said Bunyan.

"Yale-New Haven."

Bunyan grimaced. "So near and yet so far, huh?"

He turned his face to the window. "Are we really that near it?"

"Five minutes, maybe ten. Why?"

"Because—" Comprehension hit with a shattering crash. It was a simple solution, a foolish one: Frank Nikolaites did not know where he was because he

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did not remember his hometown. Oh, he knew the streets, their names, their turns, their crosses—but not their images. He knew only what the maps showed. Nothing more. Not the signs, not the shop displays, and not the stretches of sidewalk where the hustlers gathered to fast-talk passersby.

He had forgotten all that. Fifty-two (experienced) years since he had last seen anything but a road map. . . .

Home? No. A foreign country with a familiar layout, that's all.

Chichimorano let out a yelp. "I got it!"

"What?" said Bunyan.

"I call me a copdrone and you do CPR/ID Press!"

"What?" said Nikolaites.

Chichimorano hit a button on her dashboard. Bunyan said, "On the floor, quick, before the drone gets here. Stick your ID in your shirt pocket. Teach, you know CPR?"

Sontimargo said, "Yes, but—"

"Put your ID in your shirt pocket, too. Lean over him and pretend to be kick-starting his heart, you hear?" As she spoke, she slipped her own ID card out of her hip pocket and held it in her hand. "Get down, I said!"

Nikolaites, still numbed, did exactly as she had ordered. A moment later Sontimargo crouched next to him and Bunyan lowered her face to his. The sweet, clean smell of her washed over him. "What's going on?" he said.

"Easy, Uncle Nick."

A siren shrieked just outside the van. Chichimorano shouted, "My grandfather! Heart attack! Hospital! You lead!"

The drone's red flashers flickered through the interior of the maglevan. Nikolaites grunted as Sontimargo leaned on his chest once, and again, and again. Bunyan's lips pressed against his and she blew air into his mouth. He almost strangled.

"Relax." Her nose brushed his. "Chichi's brilliant!"

"What—" A heavy hand pushed on his sternum.

"Hush." She drew a deep breath and gave it to him.

He took it, though he hardly wanted it.

She winked. "Listen. Chichi's got us a police escort into the emergency room. With our ID's this close together, and the magnets on the van throwing off static, no newsie can read any of us, understand?"

"Yes." He gasped at Sontimargo's pressure. "But—"

"Shut up." She brought her face close.

"I can brea—"

This time she kissed him.

The robot orderlies moved off without fuss, but the human supervisor of Emergency Room Admitting, a pudgy pompous man whose lackluster hair hinted at nutritional deficiencies, flushed bright red and leveled a dramatic finger at Nikolaites. "Just who in hell do you think you are, mister?"

A rhetorical question, of course. The ER's ID readers had identified all three of them as soon as they had untangled themselves. As had the readers on the copdrone, which was taking Chichimorano's statement while Sontimargo muttered notes on the procedure into his memopad.

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Nikolaites, nonetheless, inclined his head in a polite bow. "Franklin Delano Roosevelt Nikolaites, at your service, Doctor."

"Where do you get off faking a heart attack and consuming valuable hospital resources?"

Bunyan said, "Can I, Uncle Nick, huh? Huh? Can I?"

The supervisor wheeled about to face her. "Stuff it, you little—"

She held the lasersaw on her left palm and stroked its handle with her right hand. "You were saying?"

"Officer!"

The copdrone swooped across the lobby. "Yes, Doctor?"

He pointed at Bunyan. "Arrest her!"

Bunyan rolled her eyes.

The drone said, "On what charge?"

"She threatened me with that saw!"

Nikolaites cleared his throat. "No, she didn't, officer. I was standing right here the whole time."

The supervisor glared at him. "Then for trespassing."

The drone said, "This lobby is a public place, Doctor."

Sontimargo, over by the entranceway, raised his voice in a shout. "Got a whole swarm of newsies coming in, Mr. Nikolaites."

"Close the door until I've gone, please."

"You got it."

The supervisor reddened even further. "He can't do that! Those doors have to stay open!"

Nikolaites turned to the copdrone. "Do you know where the Isolation, Experimental, and Critical Care Ward is?"

"Yes." It spun ninety degrees on its axis, then whirled back. "Now I recognize you! You're that Quarelay guy—"

"Yes, I am, and my brother could be dying in the IECC Ward. Do you think you could take me there before it's too late?"

"Sure can. Just follow me." It led Nikolaites to the far end of the lobby, to a door marked "Authorized Personnel Only." Bunyan and Chichimorano trailed a few paces behind. The drone dropped to waist height, and seized the doorknob with a mechanical claw. A light flashed on the drone's front; a lock clicked; the door opened. "After you."

Nikolaites and the two twippers went through just as the supervisor shouted, "Open the damn door, you bastard!"

Sontimargo abandoned his post and sprinted across the lobby.

Chichimorano said, "This funny."

Nikolaites paused a moment.

The supervisor unlocked the large doors. Which immediately swung inward under the pressure of hundreds of remote-controlled newsgathering drones. The supervisor fell over backward, looking for all the world like a man swept off his feet by a tidal wave of soccer balls.

Sontimargo pounded up to them, slammed the door behind himself, and latched it. "I told him not to do that," he said.

They followed the copdrone up two flights of stairs, through a sunlit walkway spanning Cedar Street, down a staircase, along a passageway, past a covey of white-masked interns, and into a small waiting room. "This is it, Mr. Nikolaites. Wish I could keep the newsies away for you, but it's all public record, now. You'll probably have a

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couple minutes before they get here, though. Got to go. Have a good day.'' With that, it revolved on its axis and left the way it had come.

On the other side of the room, a man stopped pacing to study them. Tall, with cropped grey hair, he had more lines in his face than a man of forty-five deserved. He frowned, not angrily, but in puzzlement, as if to ask why they had violated his privacy. His frown deepened as his gaze lit on Sontimargo. After a moment, recognition flickered in his green eyes. ''It's nice of you to come, Mr. Sontimargo, but I'm afraid Abe isn't receiving visitors. Is this your, ah, family?''

Nikolaites crossed the room. Anxiety dried his tongue, knotted his stomach. His legs trembled. He had Hosted this man on Quarelay, twenty-six (experienced) years ago, but his armor and his workname had masked him, then. When the man had last seen Nikolaites' face, Nikolaites had been an eighteen-year-old boy. ''Dad, it's Frank. I'm . . . I'm back.''

Thomas Jefferson Nikolaites opened his mouth and moved his lips. When no words emerged, he clenched his jaw tight. Closing his eyes, he passed a hand across his forehead. ''Frank?'' His voice shook.

''Yes.'' Wincing at his father's dismay, he held his hands away from his body, ready to shake or hug—or defend. ''How's Abe?''

''As well as can be expected, they say. But you—'' He opened his eyes and immediately looked away. ''My God, Frank.''

''Yes.'' He had seen himself age in daily increments, nearly twenty thousand of them, and even so, at times he could not believe that the old man in the mirror was really Frank Nikolaites. ''Will Abe—''

''God, you're the image of your grandfather just before we lowered the lid on his coffin.''

He blinked. ''You're looking well, too, Dad.''

''Oh, God, Frank, I'm sorry, I just—I'm half out of my mind with worry over Abe, and now you—'' He shook his head, then stepped forward and put his arms around his son.

Nikolaites hugged his father hard.

Brilliant light flooded the room. As he began to turn, a voice said, ''Mr. Niko—''

A buzz interrupted, and a thud. The newsdrone lay on the carpet, bisected as neatly as a breakfast grapefruit. Bunyan was switching off her saw. She grinned. ''Better move, Uncle Nick.''

He gripped his father's shoulders. ''I have to see Abe.''

''I wondered what she was for,'' said Thomas Nikolaites. ''She's very good.''

''Dad?''

''This way.'' He took his son's elbow and led him past an ID reader, down a corridor walled in glass. Beyond the glass, back in the far corner, machines clustered around a metallo-plastic box from which a score of opaque tubes emerged. ''There.''

''Inside?''

''Yes. Drugged into unconsciousness.''

Nikolaites shut his eyes, and pressed his forehead to the cool glass. ''What—what are they doing to him?''

''Everything. Cleansing his blood, augmenting his immune system, heating

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his body while cooling his brain . . . trying to cure him."

"Are they succeeding?"

"They won't know for almost a month."

"Jesus, God." He had not anticipated this. The machines, the cool fluorescents, even the glass walls, yes, for they came with the territory, so to speak, but the box— His flesh crawled. He had envisioned Abe in a bed, gowned and pallid perhaps, but not in a goddamn box. "Jesus, Dad."

"Frank, it looks bad, but Abe doesn't feel a thing, and this is his only hope. A hope he wouldn't have if you—"

"Yeah." He gritted his teeth, straightened up, and turned his back to the glass. Only then did he open his eyes.

Thomas Nikolaites lifted a hand to his son's cheek. "He would have died, Frank. Remember that."

Nikolaites nodded. "I'd like to go home, now."

Chichimorano waved a hand. "Company, Gramps!"

Damn them! He touched his father's arm gently. "Do you know a back way out?"

"Of course I do. Come on." He went to the end of the corridor, out a door marked "Fire Escape," and took them down six flights of stairs to a parking garage. "The car's over there." He pointed to the other side of the garage.

"Wait here," said Chichimorano. She strode in the direction Nikolaites's father had pointed, her chin up, her head moving from side to side. "Seems clear," she said.

Bunyan held out her hand. "ID's, folks."

Sontimargo and Frank Nikolaites passed them over without a qualm, but Thomas Nikolaites said, "What?"

"Never mind, three's enough." She sandwiched Frank Nikolaites's ID between hers and Sontimargo's. "Stay real close in case a copdrone shows up." She set out toward Chichimorano."

"What is she doing?" said Nikolaites's father.

"Masking the signal my ID puts out, so the newsies don't find us."

"That's illegal."

"But effective." His knees hurt, and so did his ankles, but he hurried to catch up with Bunyan.

His father said, "It's the blue Lagos by the pillar."

Chichimorano swerved and made straight for it. "Shotgun!"

"Fine by me." Bunyan hooked her arm through Nikolaites's. "Me and Uncle Nick'll take the back."

"Me, too," said Sontimargo. "Chichi, what about your maglevan?"

"Ain't my van, teach. Let the owner get it."

The blanket covering Nikolaites kept out the light, but not Bunyan's voice: "I've never seen so many damn drones."

'You'll see a few less if they don't get out of my driveway," said Thomas Nikolaites. The car slowed; the horn beeped. A thousand newsies shouted questions that mingled into an unintelligible roar. The car turned sharply. "Bunyan, once we're in the garage I'm going to give them ten seconds to get out. Please consider any drone that's still in the garage after that fair game.

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I'll pay you . . . how does a hundred dollars a drone sound?''

''Just fine, Mr. N., but it looks like they were reading you because they're not following us in.''

''What a shame.'' The car stopped. ''Let me close the garage before you folks get out.''

As soon as the garage doors ground shut, Nikolaites pulled the blanket down to his shoulders. ''Get your feet out of my back!''

Bunyan and Sontimargo popped their doors. ''Watch your ears,'' she said, shuffling her feet up his ribcage.

''You could have taken your shoes off.''

''Uncle Nick—'' She got out, turned, and offered him a hand. —''you really wouldn't have liked that.''

''After fifty-two years of recycled air, I would hardly have noticed.'' With her help, he maneuvered himself off the floor of the car. ''Pain, however, catches my attention every time.''

''I am sorry. Honest.'' She took his hand. ''Come on. Show me your house.''

The garage led to the kitchen, where Thomas Nikolaites was already opening cupboards and telling Chichimorano, ''That's my neighbor's son on your shirt.''

She looked down. ''Jimmy Nguyen?''

''Yes, do you know him?''

She smiled broadly. ''Lots better'n his momma like.''

Nikolaites stared. If Jimmy Nguyen lived next door, then they must have been friends, or at least acquaintances, but Frank Nikolaites did not remember Jimmy Nguyen one little bit. And even as that thought tore through him, another joined it: He could not recall any of his childhood friends. Not completely. Scraps, merely. Random images. A battered green Volkslev and a ride to school, a cold hand in his at West Rock Park, a blonde mane blocking his view in class. . . . He sagged against the wall, appalled by all he had lost when he had thought he was gaining so much.

Thomas Nikolaites set a full glass in front of Chichimorano. ''Bunyan, would you like something to drink, too?''

''Yeah,'' she said, ''thanks. Scotch. Or whatever.''

''Whatever, I think. Frank?''

''I, ah, I have to go wash up.'' Nikolaites climbed the back stairs slowly, step-pause, step-pause, trying not to think, simply to remember, step-pause, step-pause, until he found himself in the bathroom attached to his old bedroom.

Mildew put a bite in the air. Dirty clothes littered the floor, just where he had left them. He stooped to pick up a bathtowel. Still damp. He shuddered. That eighteen-year-old boy had dropped the towel there, in front of the shower stall, either forty-eight hours or fifty-two years ago. Hours, to the towel. Years, to the dropper.

Absently he capped the toothpaste, and set it neatly to one side, next to the nail clippers he had meant to pack so long ago. He washed his hands with soap whose cheap perfume assailed his nostrils, and smiled at himself because once he had thought it smelled great.

He went into the bedroom and flicked on the light. Yes. He remembered this place. After a fashion.

The same flow of time that erodes memory can also enhance it. Unavoid-

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able, probably. After enough years have passed, former possessions acquire a gloss of quality they never really had. The bed, for example. He sat on it and bounced once, experimentally. He recalled it as huge, with exactly enough firmness to promote a great night's sleep. It wasn't. It was a bed. A lumpy one.

On the far wall, a pin-up. A young woman, blonde and blue-eyed and big-chested, wearing not much lace and an expression which, at eighteen, he had thought the most adult, the most *knowing*, any woman could ever adopt. Vapid, he thought now. Empty.

The music chips beside the player . . . he picked up a few, scanned their titles, and groaned. He could not believe he had once liked such ephemera.

He had a theory, not original with himself but one he had held so long that he had forgotten its source, that youth glows golden in memory because youth has so few standards. To a youngster —which, he realized with near-dismay, meant to him anyone up to about the age of thirty—everything is new, or nearly so. And therefore, everything is either great or awful. Black and white. No greys of distinction.

He turned a chip over on his palm to expose its title. "Starborough Fair." He shuddered, and set the chip back down.

"Frank?" His father stepped into the room.

He looked up. "Oh, I. . . ." He spread his hands. "Sorry. I got a little . . . lost, here."

"I understand." Thomas Nikolaites leaned against the doorjamb, affecting an air of nonchalance through which his basic uneasiness showed all too clearly. "So, ah. . . ."

"I can't stay here." He had not meant to say it, at least not so bluntly, yet he could not take it back because it was true. "I wish I could. But I can't."

Thomas Nikolaites inhaled deeply, as a man does when he is about to argue a case in which he does not honestly believe. Then he shook his head. "I wish you could, too."

"I forgot to check. Is my luggage downstairs?"

"It was on the porch. Your lumberjack friend brought it in."

"Are the newsies still out there?"

"Oh, yes." Exasperation slipped across his face. "And a few hundred more have arrived. The neighbors are calling to complain."

"Please extend my apologies."

Thomas Nikolaites lifted his shoulders in a shrug. "When they hear what it's all about, they're not angry any more."

"Do you know, I don't remember them? The names—a few of them—yes, but the faces, the personalities, they're gone. . . . Mrs. Murphy and her goldfish, that's still there, but the Nguyens next door, all I remember is their car. Can you believe I don't know who Jimmy is?" Hands on the mattress, he levered himself to his feet. "I think I'd better go."

"And take the drones with you?"

Nikolaites laughed. "No, but I have an idea. Is Will still here?"

"Yes. Interviewing the girls about their experiences as twippers." He turned to leave, then stopped, came about, and seized his son in a sudden hard hug. "Thank you. If Abe lives, it will be

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because of you. I'm proud of you, Frank. And I'm . . . I'm sorry."

"Don't be. It was my choice."

"Yes." He released his son, then, released him to hold him at arm's length and gaze deep into his eyes. He nodded. "Yes." He caught his breath, and slapped Frank lightly on the shoulder. "Let's go."

While the twippers played with Thomas Nikolaites's holo-camera, and regaled him with tales of adventures on High Street, Will Sontimargo sculpted Frank Nikolaites's thoughts into a statement the teacher would read to the swarming newsdrones. At last Nikolaites tapped him on the shoulder and said, "Excellent. A wonderful job."

"Thanks." He touched the print button. "Let me read it to you once, for practice, before I do it for real."

"Go right ahead."

Sontimargo pulled the page out of the laserprinter, and began:

"Ladies and gentlemen of the press, many of you have asked me to violate the privacy of the individuals I Hosted on Quarelay Station. As a matter of principle, I have refused.

"This morning, I saw a pigeon for the first time in fifty-two years. It approached, and looked for food at my feet. It occurs to me that just as that pigeon has come to believe that where there are people, there is food, so have you come to believe that where there is secrecy, there is scandal, or at the least, titillation.

"The pigeon feels it has a right to the food. You feel you have a right to the 'truth,' however private or personal that truth might be.

"Now I have a confession to make. Like you, I came to see people as objects deserving close, impersonal investigation. I could plead the paramount importance of my mission—preserving the Earth from the ravages of plague—but I choose not to, in part because that would permit you to plead that your mission is to protect the people from hypocrisy, skullduggery, corruption, and incompetence.

"To put it quite simply, there is no excuse for treating each other as objects, for forgetting that each of us is a frail bundle of needs and desires, or contradictory impulses and convictions—in short, a human being.

"I did forget this, on Quarelay. I forgot many things there, because I was determined to learn so much. I forgot my friends and my hometown and the person I was when I was eighteen, but oh, I learned a great deal.

"I discussed politics with premiers, and can tell you which parties will rule in which nations, but I never explored the effect that power has on the human soul.

"Bankers and brokers taught me the secrets of investing, and I can select half a dozen wonderful stocks for you —but I have no idea what drives people to create products and companies and to dedicate their lives to making successes of them.

"With Tashimanu I studied Mongolian metaphors and their impact on American poetry, but to save my life I could not tell you why that man pours his heart into words on paper.

"Ladies and gentlemen, like you, I learned so many facts that I know almost nothing at all."

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Nikolaites lay on the floor of the car, blanket over his head again. Chichimorano said, "You ready, Gramps?"

"Is Will reading the statement?"

Bunyan said, "With many gestures and a rather melodramatic intonation. They're all in the backyard taping."

"In that case, onward."

The garage doors rumbled open; the car purred down the drive and hesitated a moment, then turned right. "We're in the clear, Uncle Nick."

"Thank you." He worked his way off the floor and onto the rear seat. Panting slightly, he brushed the dust from his coat.

"Here." Bunyan held out his ID card.

"Thank you."

"Where are you going to go?"

"No comment." He winked. "Somewhere with sunny parks and comfortable benches, I think."

"For good?"

"Oh, no. No, I'll be back. In a short while this inquisitive furor will die down—the public will focus its curiosity on new evangelists, on different poets, and no one will care what I know about yesterday's news. Then I'll return."

"How come?" said Chichimorano, making eye contact with him through the rear-view mirror.

"Because it's not enough to know the names. You have to know the faces, and the hearts, and the souls, too."

"Huh?"

Bunyan said, "I'll explain it to you later, Chichi."

"Where are we?" said Nikolaites.

"Hillhouse Avenue, Uncle Nick. Did you forget that, too?"

"Uh-huh." He sighed. "Ah, well. It will, I trust, all come back to me."

"Once *you* come back."

"Yes."

Chichimorano said, "Web Station! No newsies bumbling. Bunyan carry your bags. Luck, Gramps."

"You too, my dear."

The car stopped and Bunyan hopped out to open Nikolaites's door. He paused a moment. "Chichi."

"Yeah?"

He leaned across the seat back. In a low voice, he said, "I do think my father would like his car returned."

"No prob, Gramps. Got my eye on a nice van anyway." His face appeared on her T-shirt; she winked, and blew him a kiss. "Remember your rent paid in full, huh?"

"Now that," he said, "I won't forget." ■

●Scientific discovery consists in the interpretation of our own convenience of a system of existence which has been made with no eye to our convenience at all.

Norbert Wiener

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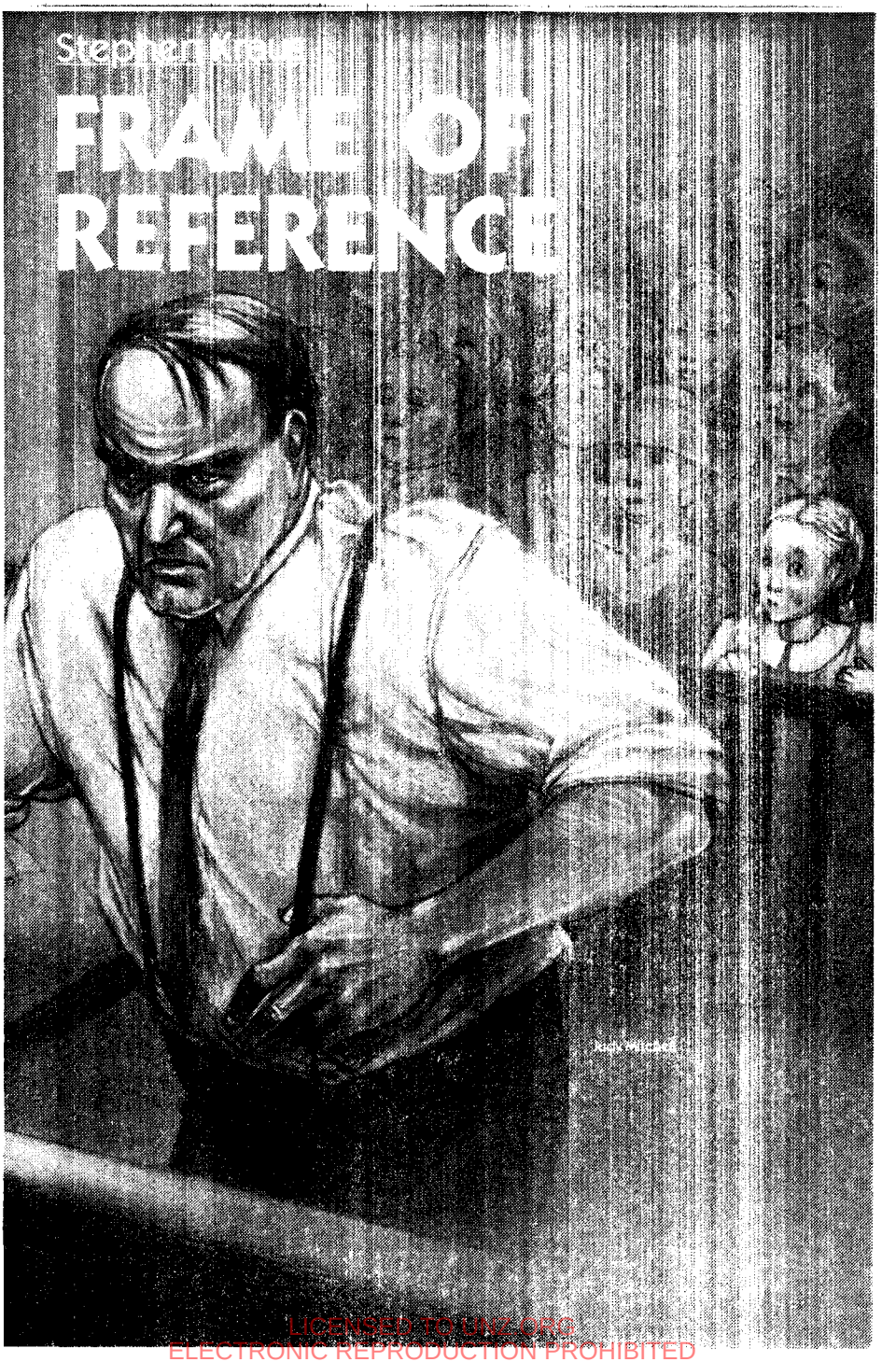
Stephen Kriese

FRAME OF REFERENCE



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The gentlemen at the library were kind enough to provide me with all these articles and references books. But after reading through them, I must say that I'm disappointed. What is so obviously missing, even to my inexpert eyes, is a primary source—a first person account of the trial of Albert Einstein. And I suppose that's why the young men here are making such a fuss now that I've agreed to write one.

I was ten years old during those eventful weeks in Louisville, Kentucky, and I wore pigtails and starched cotton dresses. And, thinking back, my first clue that the summer of 1925 would be different from any of those preceding it came at my brother Henry's birthday on June 6.

As always, we held Henry's party at our Uncle Jim's house, beneath the sweetgum trees in his backyard. Uncle Jim was the county prosecutor and our representative to the state legislature for some years before that. I even heard talk of him running for governor.

My uncle was in his sitting room when we arrived, talking to men from the capital. Waiting in the garden with Aunt Marie, I could hear their deep voices through the open windows and smell the tart shaving lotion that steamed off their smooth pink faces.

Uncle Jim joined us after the men left, and he let me straighten his tie. My uncle was enormous—he wore enough seersucker, I decided after shrewd computation, to cover our entire dining room table, with material left over for doilies.

"So you're eight today?" he asked Henry in a voice that sounded exactly like a trumpet.

"Yes, sir," Henry answered dutifully.

"Well, I'd say that's old enough to help me decide on an important matter, wouldn't you?"

"Yes sir."

"Good. Well, here's the problem, old fellow. You know that down in Tennessee they've arrested this Scopes character for teaching against the Bible, don't you?"

"Yes, sir."

"Now, everybody's making a big fuss over this case, and we don't much care for that. You see, Tennessee entered the Union just four years after Kentucky, and they've been trying to catch us up ever since. Well I reckon that's just what this is all about—trying to catch us up again. So what do you think we ought to do about it?"

Henry gave the matter some thought. "I don't know, sir."

Uncle Jim slapped his thigh. "Well, neither do I, big fellow, neither do I. But we'll come up with something, won't we? Two big fellows like us?"

"Yes, sir."

Uncle Jim stood up. I ran ahead to intercept him. He walked towards me until his belt and overhanging belly were at nose level, then he bent over indulgently and rubbed my head.

We heard about Professor Einstein a few days later. He was traveling across the United States to California, and he planned a lecture stop at the University of Louisville.

The city turned out for his visit in a fashion otherwise reserved for Kentucky Derby Day. Flowers sprung from every window box, and the horses' liv-

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ery was too bright to look at. People stood for hours in front of the professor's hotel, hoping for a glimpse of the man whose theories had changed the universe in some incomprehensible way.

The hotel gawkers were disappointed, I suspect. The gentleman who, after endless introductions and honorary investiture as a Kentucky Colonel, stepped onto the stage was far from the giant I expected. He was, in fact, rather short and had the beginnings of a paunch. And he spoke with a German accent, something I had only heard parodies of up until then.

I could handle dull speeches of thirty or (on holidays) even forty-five minutes—after all, I was the niece of a politician. But Professor Einstein's lecture went on for over an hour. I began to doubt everyone's assurances that he was the world's greatest scientist. How great could a man be whose voice didn't ring out like a river boat horn and who didn't realize when he had exhausted his audience's hospitality?

I was never half so glad to get out of church on a Sunday morning as I was to leave that stifling auditorium. A breeze blew in off the river, and I leaned back against a tree and let it wash over my arms and my face.

The town was breathless with news the next morning, and for years afterwards we traded accounts of where we had been when we heard it. I was in the kitchen chewing a bit of leftover cracklin' bread.

Professor Einstein, our maid Flora told me, had been arrested at his hotel the previous evening for teaching views contrary to the Bible at a public institution.

The adoption of the Bible Law, as we called it, was itself one of the year's memorable events. The state legislature had passed the law by the margin of a single vote in April. The papers were full of cartoons and arguments against it; but Tennessee had adopted its statute forbidding the teaching of evolution, and, as always, we had to do them one better.

Henry and I ran to Uncle Jim's house where we knew the news would be freshest. We crept into his garden and peered through the windows into the sitting room.

Aunt Marie paced furiously beneath the picture of William Jennings Bryan, and Uncle Jim sat in an armchair, wiping his forehead. His tie was more crooked than usual.

"Where do you think we live, Jim Bishop?" Aunt Marie demanded. "This isn't one of those ignorant hill towns out east. We're civilized here in Louisville. We have a ballet and a literature society! And didn't your mother teach you the proper way to treat guests isn't to have them arrested in the middle of the night?"

"Come now, Marie. The man never spent a moment in prison. He barely understood what was going on—he thought the writ was a lecture program the marshall wanted him to autograph."

Our aunt walked by the window, and we ducked down.

"We have a good case," Uncle Jim went on. "I'll get a conviction from a Louisville jury."

"That's as may be. But you'd better

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look past the statehouse now and again. I don't want you making a laughing stock out of the entire state of Kentucky. My people have lived here for five generations, and I'll not have them humiliated just to satisfy your ambitions!"

That was enough for us. We scrambled back across the lawn to the street. I couldn't imagine anyone speaking that way to Uncle Jim.

Walking down the hill to Wilson's Drug Store for a lemonade, I was struck by how quiet the city had become.

The mood didn't last. If the plan had been to divert attention from Dayton, Tennessee and the forthcoming trial of John Scopes, it couldn't have succeeded more completely.

Newspapermen from every city on earth emptied from the train cars, displacing the bootleggers and tobacco buyers and horse traders who customarily occupied the downtown hotels. A week later I heard that the charges against Scopes had been dropped.

The biggest issue during those first frantic days was whether Professor Einstein would continue on his trip to California. The Civil Liberties Union solved the problem by bringing Einstein's colleagues to Kentucky instead—where they would also be available to testify at the trial.

A few days later Pullman cars began to emit dark-suited scientists. No one paid any attention. By then foot-high headlines proclaimed the biggest news of all: William Jennings Bryan had volunteered his services on behalf of the prosecution.

I had known of Mr. Bryan from the day I was born. My mother told us stories about the three times he battled the forces of evil, and how he fought on in the Chautauqua tents and revival meetings, invoking the Word of the Lord against the money interests and the railroads and the banks. I found his presence in Louisville overwhelming. I assumed that anyone so great must be dead.

The days that followed tripped over each other in their hurry to get to the trial. The city became unrecognizable, and Henry and I spent our afternoons downtown, delighting in each transformation as it occurred.

Billboard ads for Beechnut and Grove's Chill Tonic were plastered with crude signs that read "The Sweet Lord Jesus Is Coming, Are You Ready?" Flies and bored reporters circled the hot dog stands that bloomed on the courthouse steps. And each day new eccentric characters appeared on the street corners —barefoot preachers and organ grinders and Anti-Evolution Society men. None of them, I was sure, had ever heard of Professor Einstein. They just knew that the Bible was being challenged in Louisville and had come to defend it.

I stayed up half the night of July 23 watching the rain and the lightning. I was too excited to sleep much in any case. In the morning my mother dressed us in our Sunday best, and I worried about my new patent leather shoes as we walked through the wet grass to the courthouse.

I suppose the courtroom could accommodate three or four hundred people, but anyone at the back surely couldn't see much. Nonetheless, spec-

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tators filled every seat and a hundred more stood against the wainscotted walls. We got to sit just behind the prosecution table because of our affiliation with Uncle Jim.

Professor Einstein sat at the defense table in front and to our left. Close up, he was much more interesting than at the lecture. His eyes shone, and he seemed very gentle, like the artists Aunt Marie sometimes invited for lunch. Next to him sat a big slouched man in shirt sleeves I didn't recognize. I asked my mother who he was.

"Clarence Darrow," she hissed. "He's the defense attorney from Chicago."

I asked her why Professor Einstein couldn't find a lawyer in Louisville who would defend him, but she told me to hush.

My uncle came in next and took the seat in front of us. A minute passed, and suddenly everyone was standing and talking excitedly. I stood up too, but I couldn't see past the grownups. A long time later the crowd settled itself, and I got my first glimpse of William Jennings Bryan.

Because of the curve in the railing, I could see him only when Uncle Jim leaned forward, and then just in profile. I recognized Bryan's big, stern face from the photograph in my uncle's sitting room. His jowls were heavier now, and his collar dug deep into the flesh of his neck. He sat very still, fanning himself with a palmetto.

We stood again for Judge Brody, a shrunken man with a quavery voice who I often saw at Uncle Jim's house holding a glass of bootleg bourbon.

The judge climbed up to the bench and smacked his gavel. The trial of Albert Einstein was under way.

Jury selection consumed the entire first day, and most of the morning's electric excitement had burned off before it was complete.

Uncle Jim accepted almost everyone called with a wave of his big hand. But the defense attorney with the purple suspenders and the lock of hair that fell across his eyes labored over each juror as if he were a prospective son-in-law.

The next day began with motions. All were attempts by the defense to quash the indictment for one reason or another. Mr. Darrow read them out and Judge Brody denied them just as quickly. They were formalities, I gathered, but the courtroom still buzzed excitedly with each victory.

Next, the clerk read the indictment.

"The defendant, Albert Einstein," he said, "a citizen of Switzerland, is charged with willfully disobeying section 12.148 of the penal code of the State of Kentucky, to wit: 'Be it enacted by the General Assembly that it shall be deemed unlawful for any teacher in any of the Universities or Public Schools of the State to teach any theory that denies the truth of any events, stories or descriptions given in the Bible.' "

Gasps and amens filled the courthouse. And it surely seemed a dreadful thing for Professor Einstein to have done. Only I couldn't quite place when in his lecture he had spoken out against the Bible. I leaned over to ask my mother, but she wouldn't say.

Uncle Jim's voice trumpeted as he began his opening argument. I sat straight and solemn, like in church, hoping peo-

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ple would notice that I was the prosecutor's niece.

My uncle said that the people of Kentucky loved and revered the Bible, and that no scientist, no matter how eminent, could hold it up to ridicule in a public university.

"Our impressionable youth places great value on the instruction of today's scientists," Uncle Jim said. "Imagine the good a man of Mr. Einstein's abilities could do were only he aligned with the forces of righteousness! Instead he has erected himself as a sort of new messiah, shouldering God aside with his doctrine of determinism."

Amens and scattered applause rose from the back of the courtroom.

Several reporters sat behind us. One with a British accent said: "Bloody opportunist."

"What a farce," said another.

I had to blink away tears.

Mr. Darrow stood up like an accordion trying to unfold and never quite succeeding. He hooked his thumbs into his suspenders and pulled them forwards.

"Gentlemen of the jury," he began, speaking so softly that everyone leaned forward to hear him, "I know there are millions of people in the world who derive consolation in their times of trouble and solace in their times of distress from the Bible. And I would be pretty near the last one in the world to do anything to take it away. But the Bible is a book of religion and morals. It is not a book of science—never was and never meant to be."

There were indignant whispers from the gallery. A spitball arced towards the defense table. My mother gave Henry a slap.

"Civilization itself is on trial here," Darrow went on, his voice rising. "The prosecution is opening the doors for a reign of intolerance equal to anything in the Middle Ages. No man's belief will be safe if they win!"

Darrow pointed at Einstein.

"The defendant is more responsible than any other in our century for bringing light to the minds of men. His offense is having looked more clearly into the face of his God than any man before him—be he cleric or scholar or saint. And that is a great crime indeed in the minds of small, bigoted men everywhere.

"The prosecution has mentioned Professor Einstein's eminence. Indeed, he is surely the greatest scientist to go on trial since Galileo faced the Holy Inquisition—a crime that has forever darkened the reputation of the Catholic Church."

I heard one of the reporters say: "It was just a matter of time before they brought up Galileo."

Darrow's voice cut through the whispering in the court. "Beware, gentlemen of the jury—beware that history doesn't heave you onto the same refuse heap as the masked Inquisitors of the seventeenth century!"

Shouting erupted behind us, and an angry spectator stood and waved his arms, apparently incapable of speech. Darrow wheeled and glared at the gallery.

Judge Brody whacked the bench with his gavel. I could just hear him say: "Court dismissed!" before the crowd closed in.

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* * *

We left through a side door, my mother holding firmly onto Henry's arm and mine. We were well clear before she let us stop to catch our breaths.

My mother squeezed my hand. I looked up. Mr. Darrow and Professor Einstein were standing directly in front of us, wiping their foreheads with handkerchiefs. Professor Einstein saw me looking at him, and he smiled back.

My mother glared at Darrow. Her grip tightened.

"Mr. Darrow," she said in the pinched voice she used when Henry and I ran into the house without wiping our feet first, "don't you care whether you go to heaven or hell?"

Darrow laughed good-naturedly. "No ma'am, not really. I've got a number of good friends in both places."

Just then the reporters appeared, and Darrow and Einstein retreated in the direction of their hotel.

The prosecution began their case the next day. Again, Mr. Bryan sat still and silent (the palm leaf fan always excepted), and my uncle examined the witnesses. The first of these, I was pleased to see, was my cousin Phillip. Uncle Jim questioned him very formally, as if he wasn't really a relative.

"Mr. Coldfield," my uncle asked, "did you have occasion to attend a lecture on the night of July 8?"

"Yes I did, at the university. Mr. Einstein was speaking."

"And was there any part of his lecture that you remember particularly?"

"Well, he described an experiment conducted by a Mr. Hubble at Mount Wilson observatory in California last year. He said Mr. Hubble observed individual stars in the galaxy of Andromeda and that the light from those stars took eight hundred thousand years to reach the Earth."

"And why did you take special notice of that?"

"Well, I thought at the time, now how can that be? The Bible tells us that the Earth is only six thousand years old—I remember Reverend Compson saying that when he was pastor at United Methodist. So how could light be so old?"

Uncle Jim smiled in the satisfied way he did after eating one of Aunt Marie's strawberry pies, but I was puzzled. Did that mean professor Einstein was guilty?

The crowd stirred restlessly—I think they were as confused as I. But if we expected greater revelations, we were out of luck. Four more witnesses testified that, on several occasions during the lecture, Einstein mentioned periods of time longer than six thousand years. He once implied that the Earth itself was more than a billion years old.

The prosecution rested its case in the afternoon. Mr. Darrow rolled up his sleeves and pushed his hair back irritably as he stood to begin his defense. The judge took one look at him and adjourned until the following morning.

I found Henry exercising unexpected organizational talent when I got home. He had lined up several of our friends and assigned them parts.

Earl Owens, who lived next door, got to be Judge Brody. Henry was Uncle Jim. Tom Jenkins, a cousin of ours, was Einstein. The plum role of Bryan went to Freddie Reese, whose voice had bro-

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ken and so was best equipped to play a great orator.

"You're Darrow," Henry told me.

"Why do I have to be Darrow?"

"Because you're a girl."

I couldn't argue with that.

Earl banged rocks together to begin the trial. Henry raised his fist and made insulting comments about the defendant and several members of his family. Tom, as Einstein, looked ashamed and apologized in a German accent. Then Freddie recited some of the Gettysburg Address.

"Irrelevant and immaterial," I objected. Earl overruled me.

Henry smiled as I began my opening statement. "Now watch that you don't go saying anything you wouldn't want me repeating to mother."

That boxed me in a bit, but I could still think of a few good arguments. "Well," I began eloquently, "shouldn't Miss Collins be able to teach whatever she thinks is right? If she couldn't use anything except the Bible, she'd run out of stuff to talk about pretty soon."

"Objection!," Henry shouted.

"On what grounds?"

"On the grounds that you're stupid."

Decorum collapsed shortly thereafter.

My role as Darrow changed my outlook somewhat when court reconvened the next morning. I watched him as an understudy might, following his mannerisms, memorizing his vocal inflections.

He began by calling a Dr. Bezier to testify. Darrow asked the witness his professsion, and Dr. Bezier said that he was a physicist. Behind the defense table were a dozen men who looked just like him, and I gathered that we were in for a lot of physics.

Uncle Jim said something to Mr. Bryan, who nodded.

My uncle stood up. "Your honor, the people have shown that the defendant's remarks at the University of Louisville were contrary to the teachings of the Bible. Anything these pseudo-scientific witnesses might have to say in support of those remarks could only be irrelevant and immaterial."

Darrow looked stunned.

"But your honor, our defense rests on demonstrating that Dr. Einstein simply spoke the truth, as he understands it, on July 8. Surely even the State of Kentucky hasn't legislated against the truth?"

Brody frowned.

Darrow pointed at the rows of newspapermen. "Every word of this case is being reported around the world. Think of the opportunity to educate the millions of people who are following the testimony here."

"That is precisely why the people object, your honor," Uncle Jim said. "We have no intention of allowing the defense to use this courtroom as a forum for spreading their blasphemous notions!"

There were cheers and amens.

Judge Brody held up his hands.

"I will consider the matter and make a ruling after lunch." He banged his gavel. "Court is in recess until two o'clock."

With an hour to go before court resumed session, Henry and I headed for Wilson's Drug Store. We were sitting on their iron-loop chairs, sipping lem-

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onade when Mr. Darrow and Professor Einstein walked in. Henry stiffened.

They sat down at the next table, and Darrow drummed on its glass top with his fingers. I could tell he was still angry from the morning session.

"I'd feel dreadful if we ended up hauling all these folks out here for nothing," he told Einstein.

"Hardly for nothing, Clarence. I have spent more time here with my colleagues than I could have in Pasadena. Here there is a trial only. In California there would have been dinners and receptions and honorary degrees."

Darrow laughed. "I know exactly what you mean. I always thought there'd be more to being famous than talking at ladies' poetry societies and trying to explain yourself to reporters. But I guess there isn't." He drained his lemonade in one swallow.

"And what is Bryan so famous for?" Einstein asked. "I have heard him say nothing to justify his reputation."

"Oh, don't worry, he'll speak in his own good time. Bryan wouldn't pass up an opportunity like this to give his voice a workout. It's really his voice that they want. The man behind it is a tiny thing, just a lawyer from Nebraska who wanted the crowd's adulation so badly he let his own eloquence enslave him. That voice is like a demon. It drives him mercilessly—it won't stop until it kills him."

Einstein shook his head. "Some people I will never understand, however well you explain."

Darrow rapped the table with his knuckles.

"Of course this one might be over before it begins if that yokel Brody has anything to say about it. I don't think he's quite got the hang of constitutional law."

I couldn't help giggling. I never liked Judge Brody.

Darrow turned and looked at me. I put my hand over my mouth.

"Young lady, haven't I seen you in court?"

I curtsied self-consciously and introduced myself and Henry.

"How do you like the trial so far?" Darrow asked.

"Well, I think it's awfully hot, sir." It was the only polite thing I could think of to say.

He laughed in a friendly way. "All my important trials seem to come up in the summer. I suppose it's the Good Lord's way of keeping my speeches from going on forever."

Henry jumped out of his chair. "My mother says you don't believe in the Lord. She calls you the infidel."

I tried to grab his arm, but he moved out of the way.

"And I don't think you should talk that way about Mr. Bryan either. We think pretty highly of him hereabouts, thank you very much!"

With that, Henry ran out of the drug store, his blue knee breeches pumping.

I felt my face turning red. "I'm sorry about my brother, Mr. Darrow. He didn't mean that."

Darrow sighed. "Oh, I expect he did. That's why we're down here, after all."

I curtsied again and started to back away.

"Pleased to make your acquaintance, Mr. Darrow. And yours too, Professor Einstein. I enjoyed your lecture."

He smiled. "Thank you, young lady.

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But perhaps next time I will play my violin instead and cause less trouble."

I wanted to ask him why he was doing it, why he was staying for the trial when he could have just left the state or paid the fine. But I ran out of the store after my brother.

The afternoon session was very brief. Henry stared straight ahead throughout. I couldn't keep myself from looking around to the defense table every now and then. Once Professor Einstein noticed me and smiled. I smiled back, then turned away in case anyone was watching.

Judge Brody looked as if his lunch had disagreed with him.

"I'm ruling," he said in his unsteady voice, "in favor of the prosecution on this one. I'm going to sustain their objection. The Bible is not on trial here—Mr. Einstein is. And the jury would do well to remember that. The people must only show that Kentucky law was violated. No other testimony is material."

Darrow was on his feet in a moment. The judge held up both hands.

"I realize the defense will need some time. I'll grant a recess for the weekend. Court will reconvene at ten o'clock on Monday."

Down came the gavel.

If anything, the reporters were angrier than Darrow.

"He won't have a snowball's chance in hell now," said one.

"Might as well pack up and go home."

"I can't imagine why we thought we'd get a good show down here," said a voice that sounded pure Yankee.

Uncle Jim leaned back in his chair. He folded his hands across his huge stomach and smiled like my third grade teacher used to before he hit me with his willow switch.

Mr. Bryan remained, as always, still and wax-like.

The weekend passed quietly. We held another session of our court on Saturday. I argued passionately for intellectual freedom, but the prosecution threw acorns at me and Earl fined me ten cents for contempt.

Eventually, Monday arrived, and Flora laid out freshly starched clothes for us. The court routine was familiar by now. We took the preliminaries in stride. Mr. Darrow made a few motions and Judge Brody rejected them by way of warming up. Then Darrow called for his first witness.

"Albert Einstein," he said quietly.

Einstein made his way forward while photographers snapped furiously, sensing history. He sat back in the witness chair and looked far over the heads of everyone present.

The judge leaned towards him and cleared his throat.

"Professor Einstein, the court wishes to extend you every courtesy. If you have questions during the course of these proceedings, please feel free to ask the court for clarification."

"Thank you, your honor."

The judge looked at Darrow. "You may proceed."

Mr. Darrow folded his reading glasses and put them in his pocket. "There is no need to acquaint the court with Professor Einstein's *bona fides* as a physicist," he began. "I'll just mention what

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the newspapers had to say in 1919, the year astronomical observations confirmed his theories of relativity.

"The headlines in the *London Times* read: 'Revolution in Science / New Theory of the Universe / Newtonian Ideas Overthrown.' And the *New York Times* said: 'Lights all Askew in the Heavens/ Einstein Theory Triumphs.' On that day you became a world figure, isn't that so, Professor?"

"Yes, unwillingly," Einstein answered. He seemed very much at ease. "Everything having to do with the cult of personality to me has been painful always. With fame, every remark of mine becomes a horn solo."

Darrow paused to let that sink in.

"Perhaps you could briefly explain to the court the nature of the work that has brought you this acclaim."

"Of course. The goal of my research has always been the simplification and unification of theoretical physics. For macroscopic phenomena, at least, I have attained this goal satisfactorily—"

Uncle Jim stood up. "Your honor, the people do not dispute the defendant's qualifications as a physicist. But as the court ruled earlier, physics is not relevant to this case."

Darrow scratched his head. "Your honor, I am trying to establish the background to the lecture Professor Einstein gave on the night of July 8 and the state of his mind at the time—whether there was criminal intent. Surely that is relevant."

Judge Brody hesitated, then nodded. "Very well, Mr. Darrow. You may proceed with your direct examination. The objection is overruled."

This exchange seemed to pump life into Darrow. He plucked at his suspenders like a string bass.

He had Einstein describe the experiments that measured the speed of light and the discoveries made by the new telescopes. Then they discussed the expansion of the universe, and finally the nature of distant galaxies.

With Mr. Darrow stopping to clarify the testimony when Einstein used technical terms, the subject began to absorb me. I even wanted to tell Uncle Jim to stop objecting.

After the third or fourth time that my uncle was overruled, it was clear that the judge would let Professor Einstein say whatever he wanted to. And I began to understand Darrow's strategy.

If his expert witnesses couldn't testify, Darrow would get the same information into the court record—and the newspaper and wireless reports—from Einstein himself.

Uncle Jim was furious. He tried to hide it, but his eyebrows twitched, a sure sign. And I noticed something different about Mr. Bryan's expression. The change was glacial, but after a few minutes I was sure. He was smiling.

I was impatient during the noon recess and even more so when court adjourned for the evening. The next morning, Einstein was still on the stand. He explained how the distance between stars was measured, and how the red shift and the Cepheid luminosity data agreed. I decided that I wanted to be an astronomer.

Mr. Darrow came to the end of his questions.

"There is just one more thing I would like to ask, Dr. Einstein. You've appeared at this proceeding at some in-

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convenience to yourself. Your work has been interrupted, you've missed engagements in California. And I've wondered why. I think everybody has."

Darrow's voice was low. He and Einstein could almost have been having a private conversation.

"With me," Darrow said, "I've always felt the need to dispel ignorance and intolerance whenever I've encountered it—which is pretty nearly all the time. I've been an attorney and a debater and a writer. But I've never been a discoverer. I'm always defending new ideas, never thinking them up. Are those two inseparable?"

Einstein shook his head gently. "No, Clarence. I am no crusader. Only by an irresistible longing to understand the secrets of nature is my work motivated. But the answer to your first question is simple. I am here as a lover of freedom."

Darrow turned to face the prosecution table.

"Your witness," he said.

Uncle Jim started to push himself away from the table, then froze halfway. Mr. Bryan was holding up his hand.

Bryan stood like a statue coming stiffly to life. His wax features melted and his limbs moved like metal softening in a forge. Camera flashes gave his silhouette a crackling corona of light.

Bryan waited until the whispers and shutter clicks subsided. "Mr. Einstein," he said in a voice that drew echoes from the courtroom walls, "are you a religious man?"

His words had a warmth and smoothness I could almost touch, like polished gold. The room fell cavernously silent when he stopped speaking. We all held our breaths.

Einstein seemed unoffended by the question. "I would say that I am. But perhaps not in the way that you mean. If there is something in me that can be called religious, then it is only my admiration for the structure of our world."

"But what of the next world?" Bryan asked, his voice shining at its edges. "Do you pray for salvation?"

"Mr. Bryan, scientific research is based on the idea that everything is determined by the laws of nature. For this reason, a scientist will hardly be inclined to believe that a prayer could influence events."

Bryan faced the jury with his arms raised. He shook his massive head.

"Everything determined by the laws of nature? Nothing influenced by prayer? Gentlemen of the jury, once again I am confounded by the logic of the scientists. Their logic eliminates every mystery in the Old Testament and the New and eliminates everything supernatural. And that means they eliminate the Virgin Birth, that means they eliminate the doctrine of atonement, and that when the Savior came there was no reason for His coming!"

Perspiration gleamed on the pointed bald apex of Bryan's head. His voice took on the tone of a cathedral organ.

"These scientists force upon the people of this state and upon the children of the taxpayers a doctrine that refutes not only their belief in God but their belief in a Savior and their belief in heaven and takes from them every moral standard the Bible gives us!"

Darrow was on his feet. "Your honor,

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I object. This isn't a cross-examination, it's a sermon."

But Judge Brody was no more disposed to dictate terms to Bryan than he was to Einstein.

The court held its breath again. Bryan continued.

"Your honor, gentlemen of the jury . . . the people of this state revere the Bible and cherish its teachings. The Bible is the Word of God; the Bible is the only expression of man's hope of salvation. The Bible—the record of the Son of God, the Savior of the world, born of the Virgin Mary, crucified and risen again—that Bible is not going to be driven out of this court!"

"Amen!" shouted the spectators in a body.

"Amen!" shouted the jurors and, I believe, even Judge Brody.

"Amen!" they shouted again.

Bryan gazed upwards, his lips compressed into a snarl. "No further questions, your honor."

In the boiling silence that followed, I heard Darrow say to one of the reporters: "Can you believe this trial is taking place in the twentieth century?"

"Anything further, Mr. Darrow?" the judge asked sharply.

"No, your honor."

"You may step down, Mr. Einstein. Thank you."

The professor returned to the defense table and Bryan strode magisterially towards his seat.

"Not so fast," Darrow said. He yanked at his suspenders. "*The defense calls William Jennings Bryan.*"

Closing my eyes, I can still see that moment as if it were a photograph: Bryan standing on the steaming floorboards in his string tie and wing collar. Mr. Darrow in a wrinkled pinstriped shirt, one hand gripping his reading glasses around the nosepiece. The rest of us squeezed into a sweating lump, mouths open. . . .

". . . As an authority on the Bible," Darrow added mildly.

The judge scratched his ear. "Mr. Bryan?"

"If it please the court, I have no objection."

"Very well, you may take the stand."

Darrow paced while Bryan retrieved his fan and settled smugly into the witness chair.

"You have given considerable study to the Bible, haven't you, Mr. Bryan?" Darrow asked.

"Yes I have. I have studied the Bible for about fifty years."

"And do you claim that everything in the Bible should be literally interpreted?"

I could feel the courtroom breathe as we awaited each reply.

"I believe everything in the Bible should be accepted as it is given there, yes."

"When you read that the whale swallowed Jonah, how do you literally interpret that?"

"When I read that a big fish swallowed Jonah, I believe it."

"And if the Bible said that Jonah swallowed the whale, would you believe that too?"

Uncle Jim spoke up for the first time. "Objection, your honor. The question is argumentative."

"I withdraw the question," said Darrow sweetly. "All right. We aren't here

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to argue theology, Mr. Bryan, but would you say that God has the qualities of light?''

''I am not certain that I understand your question.''

''Well, the Bible makes many references to the fact. For example, 'Lord, lift thou up the light of thy countenance,' says the Psalm. And in Exodus we have: 'the Lord went before them . . . by night a pillar of fire to give them light.' John is full of references: 'Then spake Jesus again unto them, saying I am the light of the world,' for example.

''So I ask again, would you say that God has the qualities of light?''

''I would agree that He has those qualities, yes.''

''Very well. One of the qualities of light is speed. So it follows that God can move at the speed of light. Would you agree, Mr. Bryan?''

''I would say so. God may do as He pleases.''

''Well, I will not insist that He move at the speed of light. He may lag somewhat behind if He wishes, say by one ten-trillionth of a mile per hour.''

Darrow grasped his suspenders. ''Now, the prosecution claims that Professor Einstein places visible stars millions of light-years away and maintains that the earth is at least a billion years old. This is contrary to the Bible's assertion that God divided the light from the darkness only six thousand years ago. Am I right?''

Bryan agreed.

Einstein, I noticed, had taken a pencil from his pocket and was looking for something to write on.

''But consider the situation at the time of creation. Mr. Bryan, can you quote from the third verse of Genesis for us?''

''Certainly.'' Bryan's voice took on a special timbre. '' 'And God said, Let there be light: and there was light. And God saw the light that it was good: and God divided the light from the darkness. And God called the light Day, and the darkness he called Night: and the evening and the morning were the first day.' ''

There were the usual amens.

''So, only God was around at the time, isn't that right? There were no men or creatures of the earth?''

''No, there were none.''

''In fact, this chapter in history was observed only by God. There were no other witnesses.''

''Are you suggesting that some sort of crime took place, Mr. Darrow?''

There was laughter from the gallery. Einstein, having failed to find any paper, had commenced writing on his shirt cuff.

''Hardly. I just wish to establish that, through the sixth day when God created Adam, the story of creation is necessarily told from God's point of view —from His frame of reference if you will.''

Bryan's thick eyebrows knotted. I could tell he had no idea where Darrow was headed. Neither did anyone else in the court—least of all me. Einstein had stopped writing. He was laughing softly to himself.

Darrow concentrated solely on Bryan.

''Now, Mr. Bryan, being a well-informed man generally, you are no doubt familiar with the principles of special relativity.''

Bryan looked uncomfortable. ''I have

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never found it necessary to make a study of the subject."

"Then I will refresh your memory. The particular effect at issue is called time dilation. It involves time passing at different rates at two points that are moving very fast relative to one another. A good example is the well-known twin paradox."

Bryan's eyes bulged slightly.

"You're not familiar with the paradox? I'll attempt to explain it, then. We begin with two identical twins. One takes a train, traveling at near the speed of light. The other remains at home. At their reunion many years later, the traveler still looks young and spry, while the stay-at-home has grown, shall we say, jowly and bald."

A few people in the court laughed at the obvious reference to Bryan.

"Now, the effect of time passing more slowly in the traveler's frame of reference becomes more pronounced at higher speeds."

Darrow rested his hands on the edge of the witness box.

"So. If God moved especially quickly during the creation, as surely He must have with so much to do, time would pass very slowly in His frame of reference.

Darrow brought his face to within inches of Bryan's.

"In fact, if God traveled at the speed of light, less one ten-trillionth of a mile per hour, time would move very slowly indeed. So slowly that only six days would have elapsed by His reckoning—while one billion years passed on earth! *Isn't that so, Mr. Bryan!*"

Whispers began among the spectators, building gradually to a roar. Several of the scientists broke into laughter and slapped each other on the back.

The judge punished the bench with his gavel.

Darrow's voice quieted. "So you see that there is no contradiction between the Biblical account of creation and Professor Einstein's observations on the age of the universe. Wouldn't you agree, Mr. Bryan?"

Bryan stared straight ahead. His fan twitched.

"I really couldn't say."

Darrow looked at Bryan's hollow figure shifting on the witness chair. "No further questions, your honor," he said quietly.

I remember the tone of Mr. Darrow's closing argument the next morning rather than its text. He seemed to be singing to us.

First came a spiritual, soft and mournful, citing the resistance men had always shown to new ideas. Then an anthem to the constitution—its separation of church and state, freedom of speech, freedom of worship. And finally a hymn to Professor Einstein's devotion to freedom and every American's respect for the truth.

Bryan sat motionless throughout, as if he had been hypnotized.

We drove to Uncle Jim's house to wait for the verdict. The grownups talked in whispers and the rotund men from the capital stood off to one side, like huge sea creatures run aground.

I tried to get Henry to call another session of our court so we could reach a verdict, but he refused. Fortunately, the real jurors were obliged to do so.

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It didn't take them long. After two hours a messenger came to tell us they were ready.

The courthouse was seething when we returned. Cameras snapped prematurely, unable to contain themselves. Darrow grew increasingly impatient. He rapped his knuckles against the table and ran his fingers through his hair. I could hear wagers being made by the reporters behind me.

After what seemed like an hour, the judge arrived. Conversation immediately dropped to a hum. He asked the foreman if the jury had reached a verdict.

The foreman had to swallow twice before words would come out. "Yes, your honor."

"And how do you find?"

The jurors mugged for the cameras for the last time. Flashpowder made green blobs in the air. No one breathed.

"We find the defendant not guilty."

Bryan sat perfectly still. Uncle Jim mopped his forehead. Darrow and Einstein stood up, and I think the photographer just to my right took the famous picture of them embracing.

In the unfocused foreground of that picture is a little girl with a tear-streaked face and a stiff-looking dress. That's me.

My memories of the trial end with that moment. And even now, after sixty years, nothing else in my life stands out so clearly or feels as important.

But as I write this, I can't help thinking about how easily so much could have been different. In the course of my present work I often have occasion to speculate about other planets and even other universes. Suppose on one such world the good professor canceled his trip to California—or one more Kentucky legislator voted nay instead of yea, so that the Bible Law failed. What then?

Doubtless I would never have become a physicist, though that's a minor point. My greater fear is that the influence of fundamentalist scientific doctrine might have lingered to the present day—if, for whatever reason, Einstein and Darrow had not come to Louisville during that extraordinary summer and crushed it forever. ■

●Even if the universe does not collapse into a single "black hole," it eventually may disappear into the millions of "black holes" that possibly even now are eating up the galaxies as they continue to fly apart.

John Wilhelm

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TWISTERS

Paul J. Nahin

Most businessmen are both buyers and sellers—and neither their suppliers nor their customers always fully understand the business!

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For years I had walked by the empty lot on Fifth and King Street, over on the north side of town, every day on my way to work, and that's just what it had always been—a vacant corner lot. Local kids might build a snowman in the winter, but the rest of the year it was dead. As the years went by the weeds changed, and maybe a rusted, abandoned car would give way to some discarded furniture, and there was a pretty big fire there when somebody torched a pile of half-rotted auto tires; but still, there was never anything really there.

Then one day last week, right out of the blue, there was a doughnut shop in the middle of that lot. It hadn't been there the day before, and I hadn't seen any construction work going on. It seemed strange, this doughnut shop appearing overnight. But then, with modern building techniques and materials, they could probably put up a hotel just as fast.

The shop was sort of odd-looking. Most doughnut shops are square, white buildings with large plate glass windows. If it's a new shop, the windows are clear, but gradually a thin film, probably grease, forms on the glass. If you see dead flies on the glass, that's a sure sign you don't want to buy a doughnut there. This place wasn't like that at all.

It looked like an old-fashioned antique shop, something like the curiosity shops you see in illustrations of Charles Dickens's stories. I could tell it was a doughnut shop because that's what the sign said; the smells coming out of it were fantastic, irresistible, in fact, and so in I went.

I must have been the first to discover the shop because there was nobody else inside. At first I thought the shop wasn't open for business, but it smelled so good I looked around. Along the walls was a glass display counter filled with doughnuts. But what strange doughnuts!

There were a few regular-looking doughnuts, the usual round shape with a hole in the middle. But then I saw a big stack of chocolate ones that had such a curious twist that at first I couldn't focus my eyes on a whole doughnut at once. I shrugged, assuming it was the result of some special optical effect caused by the way the glass of the counter reflected light. I heard a discreet cough, and a voice from behind me. "Ah, sir, may I help you?"

I turned and there was a little man, with long, pointed fingers, a flat nose squished over half his face, and bright, red eyes. Yeah, that's right, *red* eyes and *real* bright, which seemed almost to glow. I remember thinking the fellow must have gone without sleep for days, rushing to get his shop built and stocked, to have eyes that badly bloodshot. He smiled at me—with teeth that came to points so sharp it looked as though a rough file were jammed sideways in his mouth; but he seemed pleasant enough. I remember thinking, though, that he ought to see a good dentist.

"Yep, I guess you can," I said in reply, sticking my hand out in greeting. It's not a big town where I live, and everybody knows pretty near everybody else. "Hadn't seen your place here before," I went on, "and thought I'd stop in and introduce myself. I live just a couple blocks up the street and walk to my office right by this lot—ah, I mean

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your shop—everyday. I'm the local M.D. here, by the way. And from the way your shop smells, I suspect I'm going to be a steady customer."

The little fellow took my hand in both of his, the way those European dignitaries greet each other on the evening news, and uncovered those meat grinder teeth of his in a big grin. "Well, thank you, doctor, I appreciate so much your friendliness. Every customer is a special customer, that's my motto."

As he talked, he rubbed my hand, not offensively, but I had the feeling in the back of my mind—didn't really think about it until after I'd left, in fact—that he was massaging the skin on the back of my hand, and feeling the fleshy part where the thumb connects. Nothing *real* strange, mind you, but definitely not a standard handshake, either.

"We are running a one-week special, doctor, to build our visibility quickly in the local community." The clerk was literally beaming now, with a big, toothy smile. "With the purchase of a dozen of our regular doughnuts, another dozen of any other doughnut style is absolutely free."

Well now, even though I do yell at some of my patients about losing weight, I guess I'm a sucker for all the wrong things, too. Nothing I like better than taking a fresh doughnut and slopping it into a cup of hot coffee. Some people think doughnut dunking is just one notch above eating soup with your fingers, but to me it's one of the supreme pleasures of life.

"Well, that's pretty darn nice of you," I said, "I think I'll take you up on that. I'll have a dozen of those chocolate twisters." I pointed to the first pile of doughnuts I'd looked at—*tried* to look at—before. "Tell me," I went on, "how come your special doughnuts have such odd shapes? Don't get me wrong, they smell wonderful. But they sure don't look at all like your regular ones."

The man chuckled and rubbed his long, bony hands together. "Now, doctor, that's our trade secret, you see. We do it different than any other doughnut shop, certainly, to stand out, but the shape is also the key that gives us a much tastier product, by far. Oh, yes, indeed, it surely does!" He then walked quickly around to the back of the counter, scooped up my two dozen doughnuts in waxed paper and popped them into two big paper bags. The regular ones went into a white bag, and the dozen chocolate twisters were sealed in a bright blue one.

"Here you are, doctor. I know you'll have a new eating experience with these, and I look forward to— *meeting* —you again."

I thanked the fellow and left. Even if he was a bit woods queer, he sure knew how to make a fragrant doughnut. When I got to my office, Millie—she's my bookkeeper—greeted me with a big hello and a mug of steaming black coffee. Millie knows my passion for dunking and when she smelled the aroma coming out of my two bags she squinched up her face in fake annoyance. "Oh, God, am I going to have to start the day watching you drown a poor doughnut in coffee? What a miserable thing to do to a doughnut—and a good cup of coffee."

Millie is a nice lady, but she is sometimes a bit more outspoken than I like.

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"We all have our crosses to bear, Millie," I answered, "and yours is watching me drown doughnuts. I'll suffer splinters under my fingernails before I'll give it up. So quit trying."

"What I can't understand," said Millie, "is why, if you want to make a really disgusting mess of a meal, don't you slop some milk in the coffee, too?"

Milk in coffee is the mark of the sissy doughnut-dunker, and the look I gave her showed what I thought of the suggestion. "Even if that was a good idea, which it isn't, you never seem to have anything but sour milk for the local alley cats. No thanks, Millie."

She stomped from the room with a phony snarl. "One of these days I'm going to get so disgusted at the sight of you with a soggy doughnut stuffed in your mouth I'm going to get another job."

"Promises, promises," I yelled back, but she'd already slammed the door. I wasn't worried; Millie would never leave me. Who else but me would put up with a second mother, and a fussbudget one, to boot?

It was half an hour until the start of office hours, and there I was with coffee and two dozen doughnuts. Couldn't eat 'em *all*, of course—Millie and the two office nurses would eat some at the coffee breaks, and give the rest away to the kids who come in for warts, bruised knees, and booster shots. But I got first crack at 'em. I put the bag of regular doughnuts on my desk, opened the blue bag with the twisters, took one out, and swirled it into the mug.

The first dunk is the longest, to soften the doughnut, so I gave it a few seconds. Now, you expect the coffee level in your mug to go down a little, right? But would you expect the mug almost to dry up? Nope, you sure wouldn't, and that's why I stared at the nearly empty mug for about half a minute before I was sure of what I saw. The doughnut wasn't soggy, either, not even just a little bit damp. Just a nice, fresh, *dry* doughnut.

I took the doughnut and held it up in front of my eyes and gave it a good look. It didn't even drip. I had the same trouble I'd had at the shop—if I looked at part of the twist, the other half got sort of hazy and *slipped* out of view. And if I tried to focus on *that* part of the twist, I lost the first part. I shook it—no slushing sounds. The coffee wasn't in the doughnut, and it sure wasn't in the mug. Very curious, I recall thinking. I took the mug over to the sink in the backroom, filled it with water, and dunked the doughnut in it. The water level dropped from full to nearly empty in ten seconds flat. The doughnut was still dry. It didn't weigh any more than before, and that really puzzled me.

I snapped the doughnut in half—I noticed the hazy central part of it stopped being hazy at the instant of the snap—refilled the mug with water, and dropped both halves in. The level declined just a bit, and I watched as the doughnut slowly got soggy and crumbled into pieces. *Now* it was acting like a normal doughnut.

I repeated the entire business with another twister. Same results. It made the water in my mug disappear until I broke it, and then the doughnut acted normal. I went back to my chair, sat down, and thought about it. Maybe, I reasoned, the twisters are *always* making what's next to them disappear. I

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could *see* the water or coffee vanish from my mug, but what about a twister just held in my hand? Maybe it was sucking up the air, too. I held another twister to my ear, and I was pretty sure I could hear a slight rushing sound, like air being sucked into the doughnut. When I used my stethoscope I was *positive* I could hear a wind-like sound near the center of the doughnut. I got an idea from that.

I went back to the sink and found a large glass bowl. I put a twister on the counter and plunked the bowl down over it. The doughnut was inside a glass bubble now. I waited a minute and then tried to remove the bowl. I couldn't budge it. The damn doughnut had made all the air inside disappear, creating a vacuum! Atmospheric pressure clamped that bowl down tight to the sink. I was pretty pleased at my clever experiment until I started wondering how I was going to get my bowl back. It was a good-sized bowl, and if I broke it with a hammer the implosion would spray glass all over the place. I couldn't just leave it there, since the bowl might give way at any time.

I went back to my desk, and, rummaging around, found a pair of scissors and tried to jam one of the blades between the sink counter and the bowl, to break the vacuum seal. It worked—with a big PLOP the air rushed back in and I retrieved my odd little doughnut.

I had another idea. I picked the doughnut up by one end and placed it on top of my desk. Taking a pencil out of the top drawer, I held it perpendicular to the desk top and pushed the eraser end into the hazy center. It should have gone in maybe an inch, and then hit the desk top. I kept pushing until nearly half the pencil was in—then I pulled it out. The half that had gone in didn't come out; there was just a ragged, chewed end where the eraser had been. I broke out in a cold sweat at the sight of the mangled pencil—what if I had bitten into the doughnut, or whatever it was? The doughnut clerk wouldn't be the only one who needed to pay a visit to the dentist.

I'm no dummy; I was already pretty sure I wasn't dealing with some simple doughnut salesman. I remembered how the fellow had smiled at me with a mouth like a food processor as he'd massaged my hand. I started to appreciate how an oyster must feel just before the plunge down somebody's throat. I sat in my chair for a long time, looking alternately at the twister and at what was left of my pencil. Damn!

I decided to try one more experiment. I returned to the back storeroom and, after digging around a bit, found Albert, a human skull I use to show kids while I'm trying to explain to them how the medicine I've prescribed is going to help. He's a big hit around Halloween time. Albert has a nice, firm set of teeth and if anything awful was going to happen while eating a twister, better Albert than me. Old Albert had met his maker once already.

Back at my desk I thrust the twister into Albert's jaws. As I closed the teeth on the hazy center of the twister there was a sudden loud slurping sound and—damn! Albert, *all* of Albert, was sucked into the doughnut faster than a cold can of beer disappears at a baseball game on a hot day. Funny how you do silly things in times of stress; I suppose I should have been scared witless, but

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all I could do was swear at that doughnut. Albert had been a favorite of mine.

Now I'm just a small town doctor, but I do my share of reading and keeping up with new ideas in science. It was pretty clear to me what was going on—even if not *how*. The twisters were portals or gates to somewhere else, and it was easy to guess what happened on the "other side." Apparently anything could pass through the gate, depending more or less on how easily it flowed, but it took the proximity of teeth (or more likely anything with calcium) to trigger the suction into overdrive. That way a twister wouldn't give itself away prematurely.

But how could such a thing work? I tried to remember some of the topology math I'd had in college, before I'd gotten caught up in my pre-med classes. I recalled the old party trick of making a one-sided surface by giving a half-twist to a strip of paper before taping the ends together into a continuous loop. A Möbius strip it was called. The next higher dimensionality equivalent, a volume with its inside and outside connected without a hole through the side—it's called a Klein bottle—was supposed to be impossible to build in three-dimensional space. The professor had said it was necessary to give a normal bottle a half-twist through the fourth dimension, and that was obviously impossible. That professor must have been wrong, because I'm sure that was what those doughnut twisters were—Klein bottle gateways, tasty trapdoors, so to speak, to a place I had the feeling I'd prefer not to visit.

I carefully wrapped the twister in paper and dropped it back into the blue bag. I didn't want to take a chance on somebody taking a bit out of one, so I put the bag in my desk and locked it up tight. I was getting angry at how I had almost been suckered, and started wondering what I could do to hit back. I thought about going back to the doughnut shop, but then what? What could I do to someone who could make a Klein bottle twister? I was clearly up against a very advanced technology. I was still wondering what to do when Millie opened the door and said "We've got a slight emergency here, doctor. Buddy Hawkins had an accident a few minutes ago, on his way to school, and the nurse over there thinks he may have fractured his left wrist. She sent him over for a check-up."

"Okay, Millie," I said, relieved at the distraction, "bring him in. Put him in Room Two—I'll be right over."

Buddy is ten years old, and a bright boy. I don't treat him like a child, but more like an adult. He was sitting on the paper-covered examination table. He smiled weakly at me and said, "Hello, Doctor Adams." I could tell he was in pain, and there was a tear in one of his eyes. "Let's take a look at your wrist, Buddy," I replied. "Can you flex it?"

Buddy held his left arm out toward me and moved his hand up and down. His mouth pinched a little as he flexed the joint, but it seemed to move freely. I gently rolled the wrist between my fingers, feeling for an obvious fracture. I recalled that the doughnut man had done much the same to my hand and I stopped. "Feel any pain?" I asked.

"Not too much now. It really hurt a lot right after I fell off the tires, though."

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"Well, I don't think you broke anything, Buddy. It's a pretty nasty sprain, at worst. I'll have the nurse take an X-ray to be sure, but I think all we'll have to do is put an elastic bandage around it for a few days. Where did it happen?"

He gave me a shrug. "Over on the vacant lot a couple of blocks from here."

Somehow I knew the one he meant. "The one over on Fifth and King? The one with the new doughnut shop on it?"

"Yeah. There was a bunch of tires there and some of us kids were skipping through them, like football players do in practice. Only there's no doughnut shop there. Never has been anything there but junk."

I just nodded. That the shop had disappeared as fast as it had appeared didn't really surprise me. The place probably didn't stay too long in any one location—just long enough to unload a few dozen doughnuts and then, before people started to drop out of sight, it would move on. The clerk wouldn't need to catch many in his fiendish traps if he was running a gourmet shop; humans were probably a high-priced delicacy where he came from and he didn't require a large volume to turn a nice profit. Damn!

All the rest of that day I had to try hard to keep my mind on my patients. Always there was the memory of the bag of twisters locked in my desk, and of the face of the alien shopkeeper who gave away deadly traps in the shape of Klein bottle doughnuts. There seemed to be no way I could do anything about it. I was pretty much resigned to the idea that I was going to have to call the police, or FBI, or CIA, and give them the remaining twisters. But that wouldn't be nearly as satisfying as doing something myself. And then I got the idea for my final experiment. Since twisters devour whatever they are near, especially anything with calcium, maybe that was the key.

By then it was just after four in the afternoon, and I was pretty sure Jeb Starr would still be in. Jeb is a dentist who keeps an office next to mine. I told Millie to get him on the 'phone. Jeb thought I was nuts, but ten minutes later I had what I wanted—four freshly-pulled teeth. They had each been heavily used and abused by their previous owners, but they were just what the doctor ordered. Each was a motherlode of calcium.

I retrieved the bag of twisters from my desk. Being careful to stay away from the hazy centers, I stuck a tooth into each end of two of the twisters, and then held one twister above the other, each at right angles to the other, hazy centers lined up. I let the twister in my hand fall directly onto the one on my desk. It was like throwing a bar of copper across the output lines from an electric power station.

The two twisters ate one another soundlessly, but I staggered back out of my chair at the incredibly bright, fantastically intense flash of blue-green light that illuminated the cannibalistic meal. It was a short-circuit all the way from here to there—wherever "there" might be. On my desk, the bag containing the remaining twisters burst into flames and I quickly carried it over to the sink and ran water on it. Whatever had happened on the other side, I was

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willing to bet it was a lot more dramatic than just a bright flash of light.

I dumped the soggy remains into the sink, noticing with relief that they no longer had hazy centers. All I had, in fact, was a sink full of doughnut mush. As I looked down at the mess, I couldn't help feeling a shiver of apprehension. I knew I'd never again be able to eat a doughnut without fear. I shuddered at the thought of the kids who had eaten from the bag of regular doughnuts—what if it had been the bag of twisters? That was a risk I could never take again. Damn!

And yet—I couldn't help smiling. This time the aliens had met their match. I started to chuckle at the thought of how their food system had met its end, an ending with a surprise twist. I felt pretty good right about then, and decided to call it a day.

On my way through the front door I called goodnight to Millie. She came out of the small room where we keep a refrigerator for perishable items and said "Goodnight, Doctor, I'll close up just as soon as I clean the refrigerator. You were right, by the way—all our milk *has* gone sour. I'll dump it down the sink in the backroom."

I suppose I should have been quicker-witted, but it just never occurred to me that milk is loaded with calcium. And who would have imagined the aliens could have temporarily reconnected their Klein bottle link to the sink drain where I'd dumped the doughnuts? I was half a block down the street when an awful premonition made me turn just in time to see the flash of light through one of the office windows. I ran back, but it was too late. All I found were Millie's shoes on the floor by the sink, and an empty milk carton stuffed in the drain. This time the gate was finally destroyed. I guess Millie must have overloaded it, because the sink is plugged up, too. I can only imagine what a plumber will find in the pipes; I haven't called one yet.

Poor Millie. Poor me. What am I going to tell the police?

Damn! ■

● "Their judgment was based more on wishful thinking than on sound calculation of probabilities; for the usual thing among men is that when they want something they will, without any reflection, leave that to hope, while they will employ the full force of reason in rejecting what they find unpalatable."

Thucydides

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The Alternate View

WATCHING THE QUANTUM JUMP

John G. Cramer

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How's this for a plot scenario? A giant meteor enters the solar system, collides with the planet Venus, and ejects it from its orbit around the Sun. The collision sends Venus in a new hyperbolic path that carries it far outside the solar system. Then to make things even more complicated, our planet Earth vanishes from its present orbit and simultaneously reappears in the orbit that Venus has vacated. At the same time a huge burst of radiation is emitted which contains the energy the Earth lost in moving into the orbit of Venus.

That sounds like the worst kind of far-fetched rubber science, right? No self-respecting science fiction writer would even consider writing a hard SF story using such an absurdly unphysical sequence of events. (Even TV writers might think twice.) But in atoms, which in many ways behave like miniature solar systems, an event just like the one described above would not be all that unusual. It's called a *quantum jump*. When an atomic orbit containing an electron is vacated by, for example, a collision, another electron from a higher orbit jumps to the newly vacant orbit while emitting a photon of light to carry away the energy difference between the high and the low orbit. In this process the electron, according to quantum theory, does not move in a continuous way between the first orbit and the second; instead it disappears from one orbit and appears in the other.

In 1916 Niels Bohr first proposed his new model of the atom. The Bohr model describes the atom as having a small massive positively charged nucleus at its center with lighter negatively charged electrons orbiting the nucleus in fixed orbits. When an electron moves from one orbit to another, it must "jump" in an abrupt transition, since states of motion that are intermediate between one Bohr orbit and the next are not allowed in Bohr's model. Bohr's use of quantum jumps was disturbing to many prominent physicists of the day. They were slow to accept what was considered to be a radical idea. The notion that the electron could move from one place to another without explicitly traveling through the space between seemed more like magic than physics and so counterintuitive as to violate the very spirit of classical physics.

Later developments in quantum mechanics have left Bohr's description of quantum jumps essentially unchanged, and today the concept is routinely used in atomic physics. Indeed the phrase "quantum jump" has become a part of our everyday language. It has come to mean a dramatic qualitative change that happens very rapidly, with little in the way of an intermediate transition. It is ironic that in popular speech a quantum jump is a very large change, while a quantum jump in physics is often the smallest change possible. The electron must jump to a new orbit, perhaps from the next orbit up, because no smaller orbit change is allowed by the quanti-

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zation laws that govern atomic behavior.

Recently there has been an interesting development in this area of atomic physics. Through the use of new "trapping" techniques, a quantum jump in an isolated single atom has now been made visible to the human eye (slightly aided by a low-power telescope). The trapping of atoms or subatomic particles with a Penning trap was discussed in a previous Alternate View column ["Antimatter in a Trap," *Analog*, December 1985], but before going into new discoveries using atomic traps, let me remind you how the technique works.

A Penning Trap looks rather like a metal ring with rounded knobs above and below. The knobs are given a positive electrical charge, and the hourglass is given a negative charge. The whole assembly is placed in the bore of a magnetic solenoid which produces a magnetic field pointing vertically along the axis of the assembly. It is placed in a good vacuum. Into this apparatus, near the center of the ring, one can inject a single positively charged atom. It will stay in that position, held in place by the electric and magnetic forces of the trap. The electric repulsion of the charged knobs keeps the atom from moving vertically, and the vertical magnetic field keeps it from escaping horizontally. This device, as mentioned above, was described in an AV column about trapping antiprotons, a feat which was accomplished in June, 1987.

Profs. Nagourney and Dehmelt, two of my colleagues in the University of Washington Department of Physics, have recently used a Penning trap to study the behavior of an atom of the element barium (atomic number 56, chemical symbol Ba). They placed a single ionized atom of barium (Ba^+) in the trap. This is done by turning on the trap's electric fields as the Ba^+ ion is near the center of the trap. The trapped ion, rather like a wild animal that has just been caught, is initially in a highly agitated state and moves rapidly around in its new cage.

So it must be calmed down or "cooled." This is done by directing at the atom a beam of blue-green laser light tuned to a frequency just below some frequency that the atom selectively absorbs. Over a period of time the absorption and reemission of this light slows or "cools" the trapped atom. This happens because the kinetic energy of the atom's motion is consumed through the Doppler effect in making up the energy difference between the laser light and the light absorbed. The barium atom becomes very "cold" as its motion in the trap slows to a near standstill. If the temperature of a single atom is a meaningful concept then a barium atom cooled in this way reaches as low a temperature as can be achieved in a laboratory.

Now, with the barium atom at rest in the trap, we can examine it. The laser light that cools the atom also makes it visible. The atom alternately absorbs photons from the laser beam and then reemits them in random directions. To the eye of an observer looking through a low-power telescope (used for gathering light) the single trapped barium atom can be seen as a tiny point of blue-green light. The idea that a nearly unaided eye can actually *see* a single atom is quite remarkable in itself, and was

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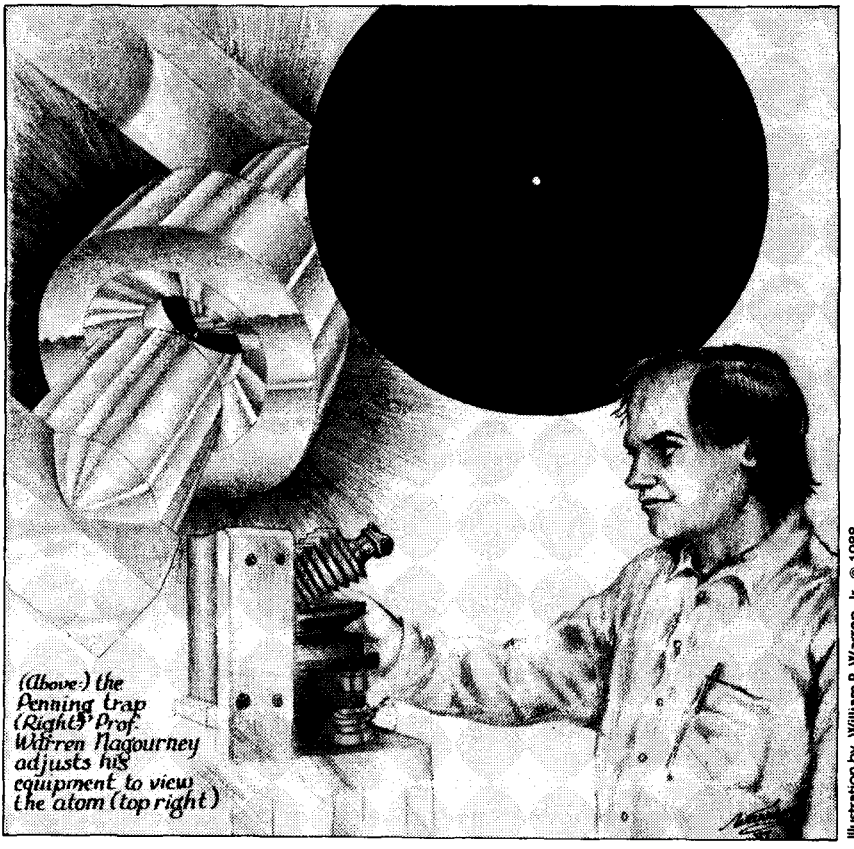

(Above:) the Penning trap (Right) Prof. Wilfren Nagourney adjusts his equipment to view the atom (top right)

Illustration by William R. Warren, Jr., © 1988

featured in a recent PPS television program. But wait, folks, there's more. . . .

Atoms can be placed in a number of "states" which are essentially different arrangements of their orbiting electrons. Each state has a characteristic energy. The state with the lowest energy is called the "ground state" of an atom. The normal condition of an atom is to be in this state. If an atom is excited to a higher energy state (called an "excited state"), it will eventually emit one or more photons and return to the ground state. In such a process one of the atom's electrons makes a quantum jump into a new orbit, and then falls back into its original orbit.

Barium has a special excited state with a very long lifetime. If an ionized barium atom is put into this state, it cannot absorb the laser light that is used to cool the ground state. And the barium atom can be placed in this long-lived state by shining light of an appropriate frequency.

So now suppose that we watch the isolated barium atom through the telescope and observe the tiny blue-green

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point of light from the absorption and re-radiation of its cooling light. Then we turn on the light source which drives it in a quantum jump from its ground state into its long-lived excited state. The point of light in the telescope vanishes. We wait for about half a minute. Finally the atom makes a second quantum jump back to the ground state. The point of light in the telescope reappears. We have "seen," in some sense of the word *see,* a single isolated atom make a quantum jump from ground state to an excited state and then make another quantum jump to return. Quantum jumps, which had been a subject of conjecture and a prime example of quantum weirdness, are now visible to the nearly unaided eye. This experiment, performed essentially as described above, was reported last year in *Physical Review Letters* by Nagourney and Dehmelt.

The idea that one can actually see a quantum jump and its effects in a single atom fires the imagination, but it is fair to ask what this effect might be used for, other than to produce a concrete demonstration of an esoteric effect. Improvements in our ability to measure increments of time with high precision have played a very important role in technological progress, from the days of Columbus, Magellan, and Drake to the present. Today they are very important in certain fundamental investigations. Modern ultra-precision time measurements use atoms as the basic timekeepers, employing the natural resonance frequencies of selected atoms like the vibrations of a tuning fork to mark off small increments of time. A device that does this is called an atomic clock.

Atomic clocks are now accurate enough to detect the time shift due to general relativity that occurs when a clock is carried around the Earth in a commercial passenger jet. A clock that has been on such a trip, when compared with another otherwise identical clock which remains at rest in the laboratory, shows a definite time shift.

But there is a fundamental problem with atomic clocks. The clock's basic timing elements, atoms placed in a definite state of vibration, are always in thermal motion. The atoms rattle around and bump together, and these motions fuzz out the precise time structure of their vibrations. But in a Penning trap the single barium ion can, by laser cooling, be placed in a state where its thermal motion is reduced to a value below the quantum limit. The result is that the thermal effects completely vanish and the atom becomes a "perfect" tuning fork.

The trapping technology therefore offers the possibility of making new and more perfect atomic clocks, so that time intervals can be measured with orders of magnitude more precision than has been possible in the past. At this level many previously unfeasible fundamental tests of theories like general relativity and quantum electrodynamics move into the range of possibility. And always in the past, when we have been able to move into a new domain of precision in measurements, we have made new discoveries. And so the confinement and study of trapped atoms offers us the prospect of completely new ways to test our understanding of the universe and how it works. ■

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IN TIMES TO COME

●A few months back, we printed Ben Bova's two-part article about life in a lunar base that could be flourishing sometime in the next century, one aspect of which was a novel set of opportunities for tourism and recreation. But the possibilities for tourism beyond the Earth are by no means restricted to the Moon, and their attractions may well provide a major motivation for getting us into space in a big way. Next month's cover is part of an unusual collaboration exploring how that might come about: cover and illustrations by David Hardy, article by Patrick Collins, all under the title "Space Tourism—The Door into the Space Age."

Our feature novelette for June will be "Gut Feelings," by Elizabeth Moon. You've come to expect strong stories with a medical basis from her, but in this one the approach is a little different from the ones you've seen so far: the focus is not on the practitioners, but on the patient. He, after all, is what the whole business of medicine is about—and he neither sees it the same way as his doctors and nurses, nor considers it the entirety of his life. But his life may depend for its continued existence on getting that treatment, despite opposition from whatever source. . . .

We'll also have stories by Poul Anderson, Pauline Ashwell, W. T. Quick, Jack Wodhams, and Michael F. Flynn. Flynn's may not look like science fiction, at first glance, but it certainly is, by one of the classic definitions of the term—as you'll see when you've read it.

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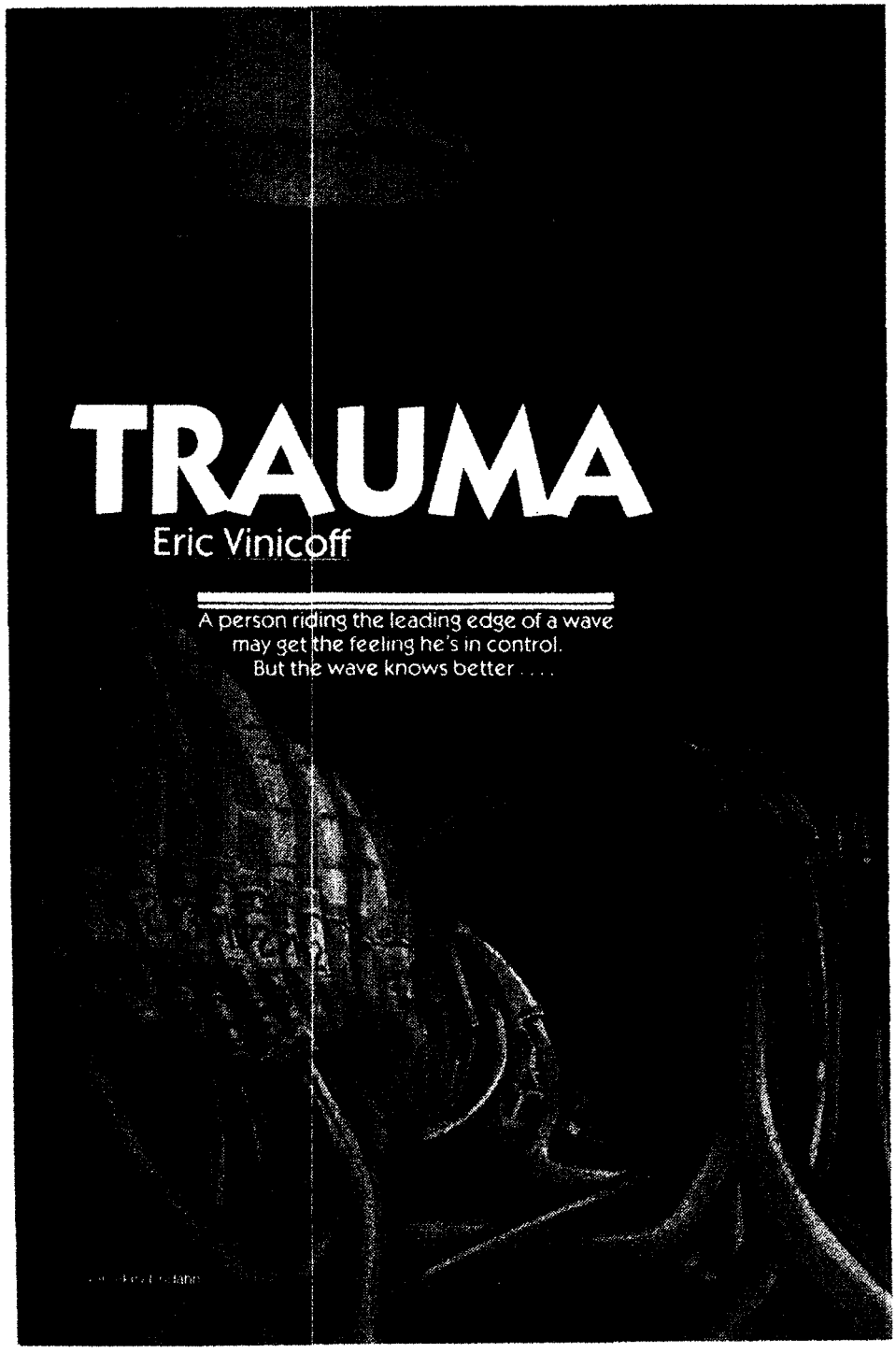
TRAUMA
Eric Vinicoff
A person riding the leading edge of a wave
may get the feeling he's in control.
But the wave knows better . . . .

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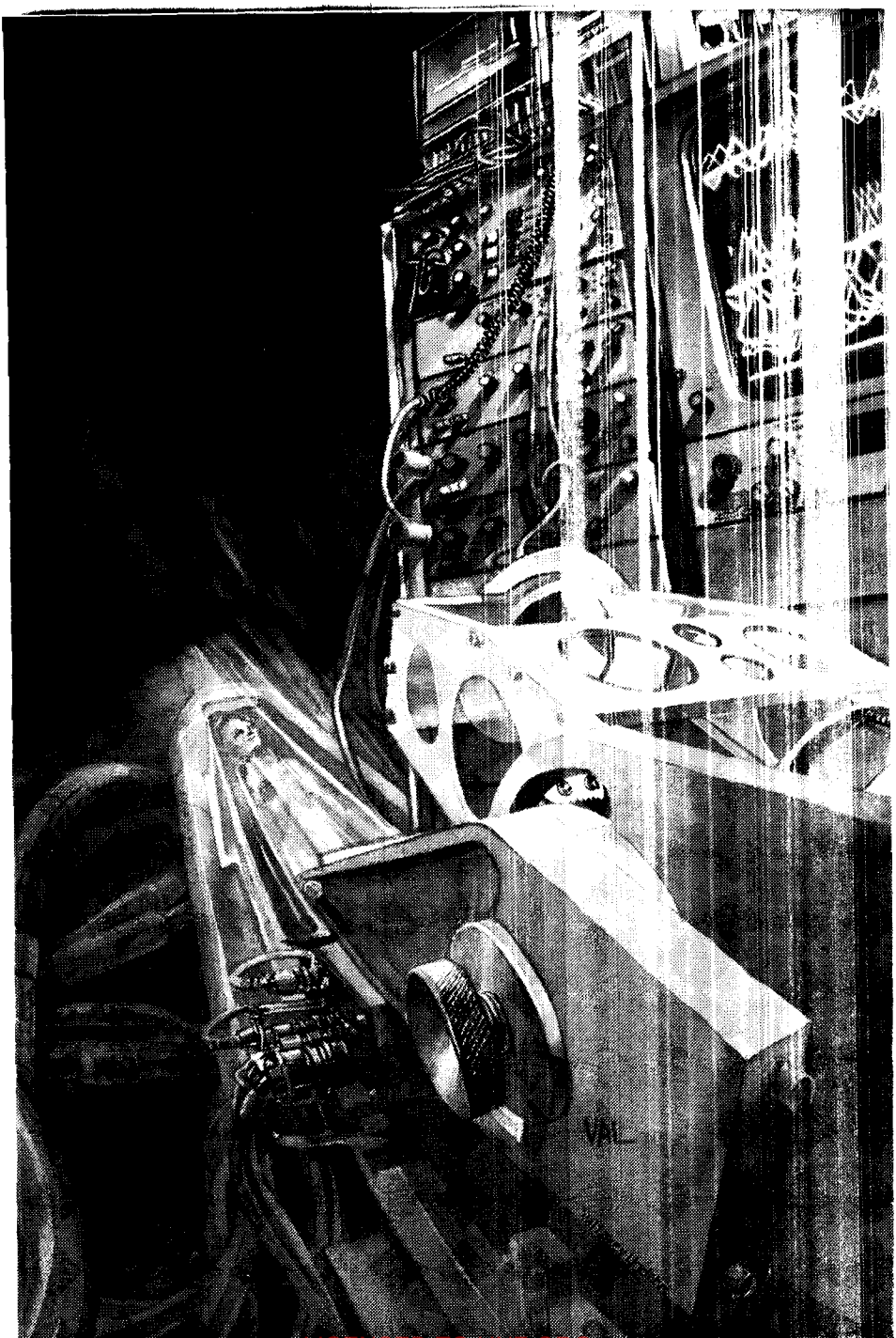

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Bill Littlejohn checked his watch before stepping into the smoky dimness of Monk's Tavern. Twenty-three minutes shy of six P.M. Good. He would have time to decompress from a killer day before Jeanne arrived.

Monk's was his favorite drinking establishment, because it was close to the plant, the decor was unpretentious, and the well Scotch was Cutty. He paused at the threshold while his eyes adjusted. The evening rush was well under way. The place was three-quarters filled, noisy with conversations, moving chairs and clinking glassware as Silicon Valley tech-types talked shop and tried pickup moves until the freeways emptied out.

Bill settled wearily onto an empty stool at the bar. The bartender spotted him, and brought over a double Cutty on the rocks. "Evening, Mister Littlejohn," he growled through the din. "Good to see you in here. Been awhile."

"Thanks, Monk." Bill savored a mouthful of the highland dew, then added, "I've been busy."

"I bet. Running a big company like yours must be a hands-on crunch."

"Squared and cubed, my friend."

Bill glanced at the back of the tavern, where a Littlejohn Test-O-Matic stood next to the cigarette machine. It looked like a modest jukebox; the straightforward brushed steel and plastic design was intended to inspire user confidence. "I see you traded in your old model for a Mark Three."

"Have to keep up with the competition. Seems like every action bar in town has one. Worse yet, the bathhouses and the by-the-hour motels are getting into the game."

Bill grinned. "I wish I could say I'm sorry to hear that."

He reached for his wallet, but Monk stopped him with a gesture. "On the house. Least I can do for the man who made the world safe for casual sex. You're a public benefactor."

"There are those who disagree," Bill said dryly. "But thanks."

Monk lumbered to the other end of the bar to serve some new arrivals. Bill alternated between tipping his glass and staring through it. The distorted view freed his thoughts from the here and now, let him step back to get perspective.

Somewhere in his childhood, for reasons no longer remembered, he had decided to be a doctor when he grew up. He worked hard to make his dream happen. But the medical schools he applied to said, "Not good enough." So he became a medical technologist instead. He spent a few years at San Francisco Metropolitan Hospital, and learned two very important things.

One was contempt for doctors. At close range he recognized the healing heroes he had once so admired for what they really were. He saw bad medicine practiced by underskilled doctors, doctors on drugs, doctors who were too old, unstable doctors, doctors who worked too fast or too slowly, and doctors who just didn't care enough. He saw patients financially ruined by having to contribute to the obscenely high income of doctors, and patients who didn't get the treatment they needed because they couldn't pay for it. He saw (and experienced) doctors treating hospital workers like slaves. Now the thought of becoming one of them disgusted him.

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The other was that he had a natural gift for understanding and improving medical machinery. At first he just daydreamed. Then he put his ideas on paper. They were impressive enough to attract some venture capital. He quit his job, and the Littlejohn Company was born in an Emeryville warehouse. It would have died there too, a victim of his business naivete, except that Jeanne Ware and her brand new MBA degree came looking for a job. They worked very well together. Soon the Test-O-Matic Mark One was selling briskly, they were building a big headquarters/plant complex in Palo Alto, and Jeanne was a full partner.

Today the Littlejohn Company employed over four thousand people and did business worldwide. The Test-O-Matic was still its main source of income, but it also produced a line of advanced diagnostic and treatment machines that sold well to hospitals.

It should have been enough. He should have been able to enjoy his success, and the way his partnership with Jeanne was becoming personal as well as professional. But it wasn't enough. From the beginning it had just been a step toward his real goal. Now, after so many years of striving, imminent victory was like an extra shot in his glass.

Monk hurried past him, but managed a quick whisper *en passant*. "Show time. Check it out."

Bill looked up at the long mirror behind the bar, and spotted the couple heading for the Test-O-Matic. She was a short but curvaceous young woman in an inexpensive skirt and blouse, probably an assembler. Pretty enough to attract a pass, which she apparently had. The man looked older, and had an incipient paunch under his four hundred dollar suit. Mid-management, or maybe a consulting engineer. Their expressions were an interesting mixture of lust, predatory excitement and an alcoholic glaze.

Actually she was heading for the Test-O-Matic, and coaxing him along in her wake. She seemed to be selling something he didn't want to buy. But his gaze kept returning to the unbuttoned V of her blouse. He stayed with her.

They stopped in front of the machine. She must have been familiar with it, since she didn't pause to read the instructions. She stuck her debit card into the slot. Part of the front panel slid aside, revealing a hand-shaped depression. She pressed her right hand into it. A few seconds later a green light flashed next to her hand, which she let drop to her side. She turned to the man and said something with teasing body language.

Two minutes went by. Then the machine extruded a small piece of paper like an ATM slip. The woman looked at it, nodded, and handed it to the man. He didn't seem very interested, but he glanced at it.

The woman was staring pointedly at him and the machine. He looked nervous, and didn't move. She said something. He shook his head. The lust and excitement were oozing out of her face; she spoke again, less pleasantly. He tried gentle persuasion, stroking her arm and whispering.

She knocked his hand away. Her expression had turned distinctly hostile. Bill wasn't the only one watching; the conversational volume had dropped several notches.

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Sweat began to glisten on the man's florid face, and he backed away. "You lousy bastard!" she snarled loud enough for Bill to hear. "I hope it shrivels and falls off! Then you'll have to keep your filthy germs inside you where they belong!"

His retreat became a rout as he all but ran out of the tavern. The woman walked proudly back to her table, to the applause of some of the other women. The incident became the topic of conversations, and things returned to normal.

Monk worked his way back to Bill. "Can I pour you another?"

"No, thanks. I'm meeting someone soon."

"Uh . . . would it be nosy to ask how your magic box works?"

"Not at all. As you know, the Test-O-Matic performs a quick, accurate blood test for the major sexually transmitted diseases—gonorrhea, syphilis, hepatitis, herpes, chlamydia, and of course AIDS. The machine takes a drop of blood from the testee, separates out the serum, splits it several ways, then uses advanced laser nephelometry and flow cytometry techniques to identify the antibodies for those diseases."

"Antibodies?" Monk asked, scratching his head.

"When a disease invades your body, your blood makes proteins called antibodies specifically designed to attach to those germs. The antibodies act like homing beacons, attracting white blood cells to attack the germs. The machine looks for the particular antibodies in quantities indicating a current rather than an old infection. It doesn't test for the germs directly, since they don't always enter the bloodstream."

Monk looked like he was regretting the question, but he nodded. "I see . . . I guess. But how does it get the blood out of my hand? I can hardly tell when it happens."

Bill laughed. "We thought that would be the easiest part of the job, but it turned out to be damned near the hardest. Sanitary and mechanical problems ruled out needles. So the machine uses a UV laser to sterilize the site in the palm. Then a microlaser drills a tiny hole, a vacuum tube sucks out the blood, and the microlaser cauterizes the hole. All in less than a second."

"You dreamed that up yourself? You must be some kind of genius."

"I had a lot of help."

Monk wandered away shaking his head, and Bill checked his watch. Six P.M. straight up.

He gave himself a quick once-over in the mirror. What he saw was a tall lean man with pale skin and a thatch of unruly black hair that made him look younger than his thirty-three years. He wore steel-framed glasses because his eyes wouldn't adjust to contacts. A very good Montgomery Street tailor had managed to hide some of his gauntness under a dark wool suit.

He straightened his tie, ran a comb through his hair, and sighed at the reflection. He was as ready for Jeanne as he was going to get. Swinging around on his stool, he watched the entrance. He didn't expect the vigil to be a long one; punctuality was one of her many virtues.

It wasn't. She came in, spotted him, and maneuvered through the merry

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crowd. She was also tall, and shapely in a big-boned way. Her blond hair was cut stylishly short. She was four years younger than he, but in her tailored suit, jewelry, high heels, and flawless makeup she radiated the coolly perfect aura of the female executive.

She gave him a quick casual peck on the cheek, then took his hand in a way that said more less conspicuously. "Welcome back, Jeanne," he said with equal casualness. Like her he disapproved of conducting personal business in public. "How was Washington?"

"Hot and muggy, as usual. My flight was eighty minutes late. I just tossed my bag in the front door, and hurried over. I'm worn down to zero."

"You hide it well. How about a drink, then dinner?"

She glanced disapprovingly at the loud herd of drinkers. "We could have both at the Grill, and talk to each other without shouting."

"Works for me."

They walked to the restaurant. Fifteen minutes later they were ordering drinks in a candle-lit back booth suitable for romantic and other private conversations.

After a few pleasantries Bill couldn't wait any longer. "So how did it go? Did you smooth out the legal path for us?"

"I met twice with Mister Brooks of Renwick and Brooks, the firm which handles our Washington affairs. He did some research and made a few discreet inquiries." Jeanne took a deep breath. "Legal problems are rarely as clear-cut as engineering ones. But his considered opinion is that we're in trouble."

Bill was used to trouble. Try to accomplish anything, and the world seemed to delight in putting roadblocks in your way. He had been hurdling, sidestepping or crashing through them for years. He would deal with this one too. "What sort of trouble?"

"The sort I've been warning you about since the beginning of the Auto-Med project."

He felt the first stirrings of irritation, and fought them. He didn't want to be angry with Jeanne, even when he had to disagree with her.

"Remember the legal battle we had getting FDA approval for the Test-O-Matic?" she asked. "The American Medical Association claimed it amounted to practicing medicine without a license. We had to remove the birth control shot feature, and still almost lost."

"But we didn't. We showed it was essentially a self-help test, citing home pregnancy and drug tests as precedents."

"Bill, the Auto-Med *is designed to* practice medicine without a license. The AMA will never let us get away with asserting FDA jurisdiction. It'll claim jurisdiction—and you know what that means."

He knew. "The AMA will try to bury the Auto-Med. It'll argue that it's protecting the public from dangerous medicine, but it'll really be protecting its members' standard of living. I expect it to fight like a cornered rat. But we'll win, because the Auto-Med works."

"According to Mister Brooks there's a very good chance we'll lose. At the least the AMA can keep us off the market for years."

"So much for the Hippocratic Oath when it interferes with self-interest."

She was staring at him intently, and

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for a moment her professional face slipped. He saw something complex and disturbing behind it. Concern? Pity? Desperation? Maybe all three.

"This is supposed to be business," she said softly, "not a personal vendetta."

"If you have a quicker way onto the market, I'm listening."

She paused. "We can get the AMA on our side instead of fighting us. All we have to do is change our FDA application so the Auto-Med can only be used under a doctor's supervision. Then—"

"No!" The sharp word came from too deep inside him to be controlled. "No doctor is going to make money off of my Auto-Med."

"But if—"

"Forget it. We're going to free people from the greed and incompetence of doctors, not reinforce their monopoly."

"Can't we at least postpone Thursday's press conference until we know better where we stand legally?"

He shook his head. "If we're going to take on the AMA, we'll need public opinion on our side."

"We'll also be giving the AMA more time to work against us."

"You worry too much," he said. "A fat anti-trust and restraint of trade suit will slow it down."

"I like you better when you talk about making good, low-cost medical care available to everyone." She showed that disturbing look again, then shrugged. "What will be will be."

His irritation subsided, and he felt oddly uncertain under the glare of her disapproval. Why couldn't she see what was so clear to him? She acted as if he were the blind one.

The arrival of the waiter was a welcome diversion. After they ordered Bill said, "Let's save the rest of this debate for the office, and move on to a more pleasant topic."

"Yes, let's." She smiled, focusing on him in a way that made him feel like he was the center of the universe. "I spent all four of those days in Washington missing you."

"Likewise," he said sincerely.

"And was it just my managerial skills you missed?"

"Well, not entirely. There's some business I'd like to conduct with you after dinner. A personnel matter."

"At your home, I suppose." She yawned theatrically. "I'm pretty tired. Is it urgent?"

"Unbearably so."

"No rest for the working woman," she sighed. "I hope you have something better than doughnuts for breakfast."

Her teasing laugh seemed natural, but he wondered what was really going on behind those hazel eyes.

Bill took a deep breath, put on a confident expression, and stepped into the meeting room. Thirty or so media reps were grazing at the buffet spread and chatting like the friendly enemies they were. The print reporters had compads and recorders bulging in their pockets. Their TV brethren moved in Siamese pairs, glossy on-airs followed around by cameramen wearing minicams like second heads.

"Good morning, ladies and gentlemen," he said in a loud cheerful voice. Public appearance usually made him

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uncomfortable, but he had been looking forward to this one for a long time. "Thank you for coming. I hope you're enjoying our hospitality."

A chorus of voices assured him they were. He did a quick survey. All four networks, the wire services, the news magazines . . . good. "I promised you a major story. I'm glad you believed me, and you will be too."

"This had better not be another company promo job," a lady reporter said around a mouthful of brie.

"It is and it isn't. First, here's your background." The Littlejohn public relations director left Bill's shadow, and passed out thick color brochures. Bill watched the media reps skim through them. He enjoyed seeing cynical indifference turn into surprise and wonder in face after face.

He jumped in before the explosion of questions. "You can finish reading them later. Right now I'm going to take you to meet the star of the show. Follow me, please."

He led them down a corridor and through a door. They found themselves in an observation room laid out like a wheel. "Please be seated," he said, indicating an inward-facing ring of chairs.

They sat, except for the cameramen who were setting up their shots. Soon the real and artificial eyes were looking down through angled windows at a brightly lit circular room. All gleaming white plastic and polished metal, it seemed to be a cross between an electronics clean room and a hospital operating room. More than a dozen gowned, masked people were busily at work. No sounds came through the glass.

Most of the activity was around a piece of equipment in the middle of the floor. Take a round-edged beer can twelve feet tall, lay it sideways on a stand, then cover it with mechanical and electronic detailing. That was what it looked like. Pipes and cables ran from it to other equipment around the room.

"Ladies and gentlemen," Bill said, "I'm proud to present the most significant medical advance since aspirin. The Littlejohn Automated Medical System —Auto-Med for short."

The mini-cams started humming softly, some aiming at the Auto-Med, some at him. Styli scribbled on compads. Recorders clicked on. Bill took a moment to gaze fondly at his pride and joy, then continued.

"The Auto-Med is exactly that. It can diagnose any known medical problem, and treat those for which there are established treatments. It can clear up athlete's foot, deliver a baby, perform brain surgery, and so on. Unfortunately, it can't cure a hangover or the common cold.

"In many other fields automation has taken over routine chores, improving quality and reducing cost. Now it's medicine's turn. The Auto-Med provides state-of-the-art medical care, uniformly, without human error. And it can be updated as new discoveries are made. It's not an inexpensive machine, but since the price can be spread over its lifetime we figure it'll cut medical costs by at least two-thirds.

"Functionally it consists of three parts. The diagnostic modules—case history, chemical and electronic—collect data from the patient. The AI computer module evaluates the data, then it directs the treatment modules— pharmacolo-

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gical, surgical, physical and electronic—which heal the patient.

"The Auto-Med isn't a radical technological breakthrough." This part of the speech was to boost public confidence. "We took a lot of things which already existed, improved them and combined them. Some, like the AI chips and the robotic manipulators, we borrowed from other fields.

"But the Auto-Med is more than the sum of its parts. It's the beginning of a new era in medical care for the human race. Any questions?"

"Isn't your machine pretty small to have a whole hospital in it?"

"Good point. It doesn't, of course. If we had built it to treat every medical problem, no matter how rare, it would have been way too big and expensive. Thus the modular design. The basic unit can treat common medical problems. For unusual cases we have a line of add-on modules. Another reason it isn't bigger is that it doesn't have to stock supplies—they are fed to it by the Littlejohn Automated Supply System."

"How safe is it? Do you think people will trust their health to a machine?"

"They do that every time they get in a car. The Auto-Med is a complex piece of equipment, but it has every safety feature known. If a unit isn't fully operational, it won't accept patients. If it has any doubt about a diagnosis or treatment, it won't do anything except maintain life-support if necessary. All in all, the Auto-Med is safer than the average doctor."

"You speak very glibly about medical matters for someone who isn't a doctor."

Bill felt the dig more sharply than he cared to admit, even to himself. "We have dozens of the best money can buy working on the project."

"What if a patient needs extended care? Does he have to stay inside the machine for days or weeks?"

"Of course not. Thanks to modern techniques that are non-invasive and/or less traumatic, treatments including even simple surgery can be done on an in-and-out basis. Most Auto-Meds will be found in hospitals because of their cost, so long-term care will be available for patients who need it."

"Can we see the thing in action?"

Bill shook his head. "Not today, sorry. We have to get FDA approval. But we'll be arranging a series of demonstrations as soon as possible."

"Do you anticipate any resistance from the medical community?"

Bill's smile broadened as he got ready to lie through his teeth. "The medical community supports advances which improve medical care, and the Auto-Med will do that in a big way. It'll free doctors from having to handle routine cases. They will be able to spend more time on the exceptional ones and on research."

The questioning went on until Bill's throat dried out and his enthusiasm waned. But finally he turned the media reps over to the public relations director, and slipped out.

He leaned against the corridor wall for a moment, breathing deeply. The die was definitely cast. By tomorrow everyone would be talking about the Auto-Med. Including the AMA.

He headed for the elevators. The afterglow from the press conference and anticipation of what lay ahead combined

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to put him in a jaggedly happy mood. He knew some of the people he passed; generally they were from the technical departments. He said cheerful hellos, and stopped twice to discuss problems.

It was a recurring source of astonishment to him how many employees he didn't know. Most of the company's dramatic growth had happened on the business side, Jeanne's empire. His mindset was still back in the Emeryville warehouse where everyone had known everyone. He watched the chatting, laughing groups on their way to lunch, and thought about how his daydreams had become their reality too. As Jeanne pointed out, a company was more than a mechanism for making and selling.

He rode an elevator up to the top floor, which was half Jeanne's office and half his. His secretary brought him up to speed on the morning's events. Then he went into his private office, sat in the chair behind his desk, and swiveled to stare out the window.

He saw a bright cloudless sky, green hills in the distance, and a wide wedge of the company grounds. The administration pyramid atop which he sat was in the middle of the grounds, surrounded by the low R-and-D and assembly buildings. Linking them were roads, walkways, parking lots and acres of meticulously kept landscaping. Somehow, in the process of creating his machines, he had ended up owning half of all this. He had been so focused on his goal that the side-effects seemed vaguely unreal. But he was learning to like being rich and powerful.

The intercom buzzed. "Yes, Paula," he said.

"Ms. Ware would like to know if you're free to see her for a few minutes. She says it's important."

His libido flared briefly, until he remembered she never mixed business and pleasure. Then he wondered what was up. "Tell her I'll be right over."

"Yes, sir."

He crossed over to Jeanne's office, and her secretary ushered him in. The office was physically a mirror image of his, but brightened with teak and pastels in contrast to his somber walnut. He always liked visiting it.

Jeanne looked up from her desktop computer. "Hello, Bill. How did the press conference go?"

"Very well, if I do say so myself. You would have enjoyed it."

"I wish I could have been there. But someone has to keep the gears turning."

Her expression was pleasant and her tone light, but he knew her well enough to see that both were forced. "Bad news?" he asked.

"Please have a seat. Would you like a drink?"

He couldn't remember her ever ducking a question before. "Suddenly I think I'd better have a tall one handy."

He settled into his favorite chair while she spoke to her intercom. Moments later the secretary brought in a Scotch for him and a vodka martini for her. When they were alone again she said, "So we're committed. Now what?"

"Now we win."

She paused, visibly nerving herself up to something. "No, we don't. Not your way."

He felt an irritation that was becoming too familiar. "We've been all through this before."

"I'm sorry, Bill, but I have to try one

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last time. Now that we've gone public, the AMA is going to start moving against us. It'll do everything it can to block FDA licensing of the Auto-Med. Which happens to be quite a lot—you have no idea how powerful a lobby it is."

"And you have no idea how powerful public opinion is. We're offering better, cheaper medical care for everyone. They won't let the AMA and the bureaucrats bury it."

"You're assuming people will accept the Auto-Med," she said urgently. "But we're going to have to convince them it's safe. That will be hard enough as is—you've seen the surveys. If the AMA sets out to prove otherwise, I don't see any hope."

Bill tried to stay calm. "Why are you fighting me? Don't you want the Auto-Med to succeed?"

"Of course I do!" she said with surprising heat. "But there's only one way it can. We need to get the AMA's support."

"By licensing the Auto-Med for use only by doctors?"

"Yes."

"The hell with that! I told you, it's out of the question!"

"Bill, please try to be rational. I understand how much you hurt. I . . . If I could take the pain away, I would."

He felt like she had poured liquid hydrogen down his spine. "You had better explain exactly what you mean by that."

"A long time ago the medical establishment rejected you, so you've envied and hated doctors ever since. You want to get even by putting most of them out of work."

He had had that argument with himself before. "You really believe I've done all this just out of spite? Those schools did me a favor by saving me from a lousy career choice. Sure, I don't deny enjoying what I'm doing. Doctors deserve to have their pedestals yanked out from under them. But the enemy is inferior, over-priced medical care."

Jeanne shook her head. "You've done a lot of good things, but almost inadvertently. Admit it to yourself if not to me. Please!"

He hated how she was using their intimacy to attack him. "If I want any psychoanalysis, I'll go to a professional. I don't appreciate a business associate trying to get inside my head."

"Is that all I am to you?" she asked in a soft, strained voice.

His anger answered, "Yes."

All expression left her face. "Very well, Bill. As your partner I'm asking you to listen to my proposal. In the long run it'll—"

"No. My decision is final."

"The company stands to lose a great deal of money if the Auto-Med is kept off the market. Don't you feel any responsibility to your employees? Or me?"

"If it wasn't for me, there wouldn't be any company."

A painful silence stretched taut between them. Finally Jeanne spoke. "I'm sorry, Bill. I hope someday you'll understand why I'm doing this."

"Doing what?"

"Knowing you, I was afraid you would take a hard line. So when I was in Washington, I met with Doctor Wood, the president of the AMA."

It took Bill a moment to believe his

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ears. "You told him about the Auto-Med?"

"Yes."

"Why?"

"I pointed out the effect the Auto-Med would have on employment in the medical profession if the FDA approves it for unlimited use. Then I offered my proposal as a mutually beneficial compromise. He was cautiously interested. Mister Brooks's expert opinion is that the AMA will have to agree—it can't risk even a slight chance that we might win approval for unlimited use. So, instead of being tied up for a decade and maybe forever, we can be on the market in less than a year."

"What the hell do you think you're doing, making deals behind my back! Well, it won't work. We're equal partners. You can't change the FDA application without my agreement."

She reached into a drawer, brought out a piece of paper, and pushed it across the desktop. "I suggest you have your personal attorney review this. It's a copy of a contract we both signed last week, authorizing the sale of an additional ownership share. I bought that share. I'm now the company's majority owner, and under the bylaws I can set policy unilaterally."

He snatched up the paper, stared at it. His signature under hers looked genuine. He regularly signed business papers she sent over without trying to decipher the legalese, because he trusted her.

He stood in the center of a universe which had suddenly stopped making sense. He loved Jeanne, and thought she loved him. Even if she didn't, he would have bet his life on her friendship and loyalty. Yet here she was matter-of-factly stealing everything that meant anything to him. His company, his Auto-Med, his victory; all gone. Could she be that worried about protecting her wealth and power? If so, he really didn't know her at all.

Anger spread from his gut like the shock wave of a nuclear explosion. He threw his glass against the far wall. It shattered with startling loudness.

He leaned over the desk and glared at her. She met his eyes unwaveringly, her face a chilled steel mask. The shock wave reached his hands. He had never hit anyone before, but now his right arm swung. The slap numbed his palm. It also knocked Jeanne around in her chair. He thought he heard stifled sobbing.

"Bitch," he growled. He took the paper and left.

Bill spent the next three days confirming with several attorneys that Jeanne's trick had been thoroughly executed. He received registered letters from the company informing him that he had been voted out of his co-presidency, that his ownership share was being bought out by the company, and that all his ties to the company were hereby severed.

His anger drained away, leaving him lost, alone, afraid to trust anything or anyone. For two days he hid in his house, hanging up on Jeanne's calls, not letting her in when she came to see him. He didn't want to live through any more of her betrayal or her perversion of the Auto-Med. The doctors had beaten him again, this time for good.

Suicide didn't tempt him, so he decided to run away. Being a rich man he

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could do it in style. A week later he was the owner of a sixty-two foot ocean-going yacht, which he renamed *Trauma*. He stocked it with all the interests he had put aside to concentrate on his goal; novels he had meant to read, subjects he had meant to study, sports and hobbies he had meant to try. He hired a crew and laid in provisions. He arranged for his attorney to handle his affairs with a minimum of contact while he was gone. Then he sailed into the sunset.

Micronesia. Melanesia. Polynesia. Thousands of tropical islands spread across the Pacific, remote places where a man could lose track of the rest of the world. Bill set out to do just that. The islands and ocean offered many diversions, and he sampled all of them. Except romance; he had had enough of that for one lifetime. He studiously avoided medical news. When he needed doctoring, he got it without social frills.

He did his best to forget. Eventually he stopped fingering his memories to see how much they could hurt. But the question wouldn't go away. Why? Why had Jeanne done it? The more he tried to tell himself he didn't care, the more he had to know. Even so, the process of overcoming his stubbornness took a long time.

Four years.

Bill was standing at the bow rail as the *Trauma* eased into its slip at the San Francisco Yacht Club. The afternoon was cloudy and cool, and a stiff breeze sent his long hair streaming behind him. He watched two crewmen jump onto the dock and secure the lines. The throbbing of the diesels died.

He went below to his cabin to check himself in the mirror. Except for his arm he was in the best shape of his life; trim, tanned and lithely muscled. His hairline had retreated a bit, but he felt younger than he had when he left. The dark suit from a French tailor in Tahiti fit his new physique well. He combed his hair and nodded.

He walked down the gangplank, took care of the paperwork at the dock-master's office, then had a cup of coffee in the clubhouse bar to warm up. Actually, he was stalling. Eager as he was to confront Jeanne, he was nervous too. Four years was a long time. Maybe he should reorient himself first.

His left arm still ached where the boom had slammed into it. The bruise was almost gone, and the injury didn't seem any worse than a dozen others he had shrugged off. But it was an excuse to give in to the desire that had been growing since he set his homeward course.

"May I see the yellow pages?" he asked the bartender.

"Certainly, sir." Moments later the fat book was set in front of him.

He flipped to the P's to find a doctor. For his arm, and for information. The Auto-Med was his brainchild no matter what. He wanted to know how it had turned out, to see it in action if possible.

He couldn't find the physicians listing.

He went through the P's again more carefully, and found it. But what he saw made no sense. The listing used to take up dozens of pages. Now it barely filled one. He checked the book's spine, but no pages were missing.

He noticed a cross-reference at the end of the listing; See Health Mainte-

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nance Organizations. He turned back to the H's, and stared. HMO's had been the coming thing before he left, a handful of companies competing in a volume business. That there should be more now was reasonable. But not this many. He flipped past page after page of display ads, and estimated the total at well over two hundred.

Soon he was in the back seat of a cab fighting through city traffic. Downtown San Francisco had changed somewhat, but he wasn't interested in the scenery. He was trying to figure out what had happened to medical services. The Auto-Med, probably, but how? Had Jeanne's carefully wrought trick gone wrong?

He was constantly aware of the gun's hard cold presence under his armpit. He intended to get an explanation from the treacherous bitch, now more than ever, and he wasn't going to take no for an answer. Beyond that he had no plans. He didn't delude himself that he could force her to sell his half interest in the company back to him. He didn't think he would kill her.

"Made up your mind yet, pal?" the driver asked.

"Huh?" Bill was startled out of his reverie.

"Where to?"

Bill had picked a HMO at random from the listing. "Sunshine Health Service, the Market Street branch." Suddenly he wondered about the third side of the medical care triangle. "And swing by SF Metropolitan Hospital on the way."

"It's your money."

Bill wanted a look at the hospital where he had worked several lifetimes ago. From a block away it seemed normal. But as they drove by he saw that the whole building complex was dark and still. The entrances were chained shut, the first floor windows were boarded up, and the grounds were becoming an unofficial garbage dump.

He felt excitement stirring inside him as his long-dead hope revived. But underlying it was a sense of disquiet, the little-boy feeling of having done something wrong but not knowing what.

The SUNSHINE HEALTH SERVICE sign hung over a medium-sized storefront. He settled up with the driver, then went in. He found himself in what looked like a doctor's office waiting room. It was empty at the moment, but there were enough institutional furniture to accomodate a dozen people. He walked over to the receptionist's window.

"Excuse me," he said to the young lady doing her nails behind the window.

"Welcome to Sunshine Health Service," she replied indifferently. "What can we do for you?"

"Actually, I'm not sure." He tried to smile disarmingly. "I've been out of the country for a few years, and it seems there have been some changes. I'm looking for a doctor."

She put away her polish, and seemed a bit more interested. "Some sort of specialist?"

"No, just a regular GP."

"I suppose there are still some around, for folks who are anti-mech. Or you could go to a hospital that hasn't folded. But why pay more for what we do better?"

Anti-mech! That had to mean this place used Auto-Meds! "Would I have

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to be a member of your health plan to get treatment for my arm?" he asked.

She giggled. "You are out of date, aren't you. Everyone offers walk-in service—competition, you know. Will that be cash or debit card?"

He slid his card across the counter. "I may as well get a full physical examination too. I've been at the mercy of provincial medicine for quite a while."

"Okay." She fed the card into her computer terminal, followed by his name/address/phone number, then handed it back. "Through the door to your right, please."

The door opened as he approached it. A nurse met him in the corridor beyond. "This way, please," she said crisply.

She led him into a small room done in soothing beige tones. A comfortable chair faced a TV screen built into the wall. "Please be seated," she said, then left.

A fatherly man in a doctor's gown appeared in the screen, sitting at a desk in an office that reeked of medical success. Or so it seemed. Bill felt a tingling warmth as he recognized the son or grandson of his original design. The "doctor" was a computer simulation, part of the Auto-Med's diagnostic module.

"Good afternoon, Mister Littlejohn," the "doctor" said in a fatherly but professional voice. "I see this is your first visit, so I'd like to ask you some questions about your medical history—"

Bill answered questions and explained about his arm for fifteen minutes. Then the screen went dark. The nurse returned, and took him next door.

This room could have been a bathroom except for what looked like a round hatchcover in one wall. The nurse had him strip (he managed to hide the gun) and take a shower. The nurse was over fifty and built like a fullback; even so he felt uncomfortable under her impersonal gaze.

She touched a button on the hatchcover, and it swung open. As the gleaming aluminum and plastic latticework of a manipulator couch extended into the room, he realized that the hatchcover was actually the entry end of an Auto-Med beyond the wall. "Let me help you up," the nurse offered. "It can be a bit tricky."

She was right. Soon he was lying face-up on the dozens of plastic supports. It wasn't very comfortable, but he knew he wouldn't be awake long to feel anything. The cool electro-sleep contacts attached themselves to his scalp.

"Don't worry about a thing," the nurse said soothingly. "It's just like taking a nap—"

The next thing he knew he was waking up. His left arm ached faintly, and he felt cold. Opening his eyes, he saw the same white ceiling and the same nurse's face.

"How did it go?" he asked.

"Perfectly, of course. Here, let me help you down." She did, then left while he dressed. The place on his arm where the arthroscopic probe had pierced the skin was covered with a bandage.

The nurse was waiting for him when he stepped into the corridor. She led him back to the room with the TV screen, handed him a sheet of computer printout paper, and disappeared again.

"Well, Mister Littlejohn, everything

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looks fine. The pain in your left arm was caused by a bone chip, but it's gone now." The "doctor" went on to discuss the surgery and the results of the physical examination, while Bill followed along on the printout.

The nurse came to take him back to the waiting room. He had been concentrating on the details of the experience, delighting in how closely it matched his imaginings. But now his thoughts returned to the big mystery. He realized what was missing.

"Excuse me," he said to the nurse, "but isn't the Auto-Med supposed to be used under a doctor's supervision?"

She looked puzzled. "Of course. Doctor Thomas is on duty now, I believe. He's very good. He reviewed your case—that's his signature at the bottom of your record."

"May I see him?"

Her face showed the irritation of a busy person whose routine is being unreasonably disrupted. "If you wish. This way, please."

She knocked on a door with a nameplate reading; ROBERT THOMAS, M.D. A voice grunted, "Come in." She opened the door and gestured Bill inside, but didn't go in herself.

The window-less office was small and plain. The desk and chairs had probably come from the same manufacturer as the waiting room furniture. An effort had been made to brighten the office with framed diplomas and other mementos, but it didn't work very well. Medical data glowed greenly in the screen of the desktop computer.

A balding middle-aged man sat back in a chair with his feet up on the desk. His three-piece suit was good quality, but old and beginning to fray. His shoes needed a shine. He looked at Bill with empty eyes, and asked, "May I help you?"

"I'd like to talk to you for a moment, if it's convenient."

"By all means, have a seat. My time is of completely negligible value."

Bill sat in a chair across the desk from Doctor Thomas. He was close enough to see the doctor's unfocused eyes, and smell the sourness of alcohol on his breath.

"You're Mister Littlejohn, the arm surgery and physical, right?" Doctor Thomas asked. "I'll just punch up your record and—"

"I'm not here about that. I'm . . . I've been out of the country for a few years, and I don't understand this new setup."

"That makes two of us," Doctor Thomas muttered with infinite bitterness. "What would you like to know?"

"How you fit in here. The nurse said that you review the work of the Auto-Meds."

"See this damned machine?" The doctor pointed a bony finger at the computer. "It tells me how those other damned machines have decided to treat the patients. When the faxer spits out a case record, I sign it. Occasionally I get to reassure a patient that the machines know what they are doing."

"What if you spot a mistake?" Bill asked. "Can you advise or overrule an Auto-Med?"

"The machines don't make mistakes or need advice. Any case beyond their parameters is sent to a specialist or hospital."

"You mean you don't treat patients at all?"

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"Surely you jest. The technicians won't even let me near their precious machines. I'm here because the law says I have to be, and for no other reason."

Doctor Thomas was looking down at his hands. He paused for a moment, then went on mostly to himself. "I was a doctor once. A good one. Medical school, internship, residency—so many long, hard years to learn how to be a healer. Eighteen years in private practice. How many people did I help? Hundreds? Thousands?

"Now I sit here and watch machines do the work that I dedicated my life to. You can't practice medicine without patients. I'm supposed to be fortunate to have any job at all—doctors are a glut on the market. I receive the same salary as the receptionist. A fine joke, no?"

Bill didn't say anything. He got up quietly and left.

In the corridor he took several deep breaths. He felt sick. He made himself stop thinking about Doctor Thomas, and his stomach juices subsided a bit.

The nurse appeared again, and guided him back to the waiting room. It had acquired a few potential patients. He glanced at his watch. One hour and seventeen minutes from entry to exit; not bad.

The receptionist handed him a receipt. He looked at it, then looked again. He had known the Auto-Med would bring costs down, but a hundred and thirty-five dollars for surgery plus a full physical exam?

The receptionist saw his expression, and grinned. "It's the competition, you know. Regular price war going on."

"I certainly picked the right time to get hurt. Would you call me a cab, please?"

"Sure."

He watched patients being processed in and out until his cab arrived. Climbing into the back seat, he asked the driver, "Do you know if the Littlejohn Company still has its plant in Palo Alto?"

"You kidding? If it gets any bigger, it'll *be* Palo Alto."

"Good. That's where I want to go."

The driver licked his lips at the size of the fare, then threw his vehicle into the rush hour traffic. Dusk was darkening the sky as the sun dropped beyond the Pacific. No fog tonight.

Bill sagged back in the seat, and let the bitter thoughts rise to the surface of his consciousness.

He had won. His victory was more complete than any he had ever imagined. Despite Jeanne, despite the AMA, despite everything, the Auto-Med was replacing doctors. His dream of improving medical care was coming true.

So why didn't he feel victorious?

Because he had finally looked at the face of his enemy, and seen the truth. He had always known, but never admitted, that the bad medicine was only a small fraction of the total. For every doctor who deserved to be obsolete there were many Doctor Thomases, competent practitioners and decent human beings whose lives had been shattered.

The face of his enemy was the same one he looked at in the mirror.

When the cab entered the Littlejohn Company grounds, he saw what the driver had meant. The assembly and warehouse buildings had multiplied fivefold, and judging from the vehicle

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and foot traffic they were running at least two shifts. Business was good.

Jeanne's business. The flicker of nostalgic excitement lapsed back into depression.

The cab let him out in front of the administration pyramid. He entered the lobby area, which had been remodeled to look even higher tech. Most of the building's workers had left with the day shift, and the lights were dimmed. The silence seemed empty and ominous.

He walked over to the security system. Not surprisingly, he didn't recognize the young surfer-type guard on duty.

"Excuse me," Bill said, "is Ms. Ware in her office? I'd like to see her."

The guard glanced at him casually, and did a cartoon double take. He gulped. Then he checked something on his electronic console, whispered into his throat mike, listened to his earphone, and said, "Ms. Ware will see you. Come with me, please, Mister Littlejohn."

Bill was surprised. "Do I know you?"

"No, sir. But we have specific orders to know you. This way, please."

The guard escorted Bill to the elevators, and took him up to the top floor. They walked past his office. It was dark, but his nameplate was still on the door.

The guard showed him into Jeanne's office, but stayed outside. The outer office was unlit, and the secretary was gone. He crossed to the inner office door. His hand paused on the knob while he fought down several emotions. Then he opened the door and went in.

There were new flowers in the window pots, and new paintings on the walls, but otherwise the office looked the same as when he had stormed out of it four years ago. The lights were low except for a bright puddle around the desk. Jeanne was seated behind the desk, just like the last time.

She got up and came around the desk toward him. "Welcome back, Bill," she said softly. Her professional mask was firmly in place.

His nerves tingled in resonance with the too-well-remembered voice. She stopped at the edge of the bright area, five feet in front of him. She was still beautiful. Her white suit and hair were cut in what he supposed were current styles. She hadn't gained a pound, and the only change in her face was a few fine wrinkles around the eyes which added character. There was no ring on her finger.

"Whatever you've been doing, it agrees with you," she said. "You look good."

"So do you."

"According to the security scanner you have a gun in a holster under your left arm. Is that for me?"

Bill brought out the short-barreled French automatic, and stared at the ugly mechanism. "It was. But maybe I should use it on myself instead."

She took it out of his hands, and set it on the corner of the desk. "You won't need it for either of us."

"I came here to find out why."

"I would have told you, you damned idiot, if you hadn't run away like a petulant child!" Anger and pain shattered the mask. "I tried to explain, but you wouldn't listen!"

He had rerun their last meeting a few

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thousand times. She was right. "Now I'm listening."

She didn't say anything. He stared at her. Puzzle pieces were flying around in his mind, and finally he had enough of them. They came together with an almost audible click.

"You knew all this would happen," he whispered. "About the Auto-Med. Didn't you?"

She nodded. "I thought the matter through. Your blind spot kept you from seeing what was inevitable. Fortunately most AMA members didn't see it either. That was why I had to move so fast, so the few who did wouldn't have time to effectively oppose the deal. Even so it was a very near thing."

"I still don't see."

She turned away and looked out the window at the starry night. "I wanted the Auto-Med to succeed every bit as much as you did. Not because of your idiotic vendetta. Because of the good it could do, the money it could make for us, and, . . . Anyway, you were dead set on fighting the AMA, which would have kept us off the market for years and maybe forever. So I had to stop you."

"But you let the Auto-Med be licensed for use only under a doctor's supervision. The AMA should have been able to control it. What happened?"

"You saw the conflict as one between doctors and us, but there was another factor to consider. Medicine in this country is a business. The people who run the business generally aren't practicing physicians—they are profit-oriented businessmen, to whom the cost-cutting aspect of the Auto-Med would appeal. I talked to some HMO operators, and I made sure the Auto-Med's FDA permit was sufficiently vague on *how much* doctor's supervision was required. Economic forces did the rest."

She spun to face him, a light of pride in her eyes. "The Auto-Med is everything you hoped it would be. It has proved itself to the people and the businessmen. We have plants in Tennessee and North Carolina, and Auto-Meds are being built under license in seventeen other countries. We've developed models for ambulances and air-rescue helicopters. High quality, low cost medical care is becoming available to everyone. The old infrastructure is being dismantled except for special care and research."

The memory of Doctor Thomas stabbed him like a scalpel. "Dismantling the infrastructure. A nice phrase, very clinical and impersonal. How many careers has my Auto-Med brushed aside to create this new era?"

Jeanne stared at him, and it felt like she was measuring his soul. "Doesn't your victory over doctors please you?" she asked.

"You were almost right about that. I did want to tear down their castle, because they wouldn't let me in. I tried to hate them. But I really hated myself for failing."

"If you can see that, surely you can see how stupid your self-hatred is. So you weren't cut out to be a doctor. You've done more to make people healthy than a thousand doctors."

"I thought I'd enjoy ruining lives. I don't."

Something softened in Jeanne's face. "You have no idea how much it means to me to hear you say that, Bill. But try

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to look at the other side of the ledger, the good you've done. Major inventions usually end ways of life. It's the price of progress."

Bill knew that intellectually, but it would be some time before his heart agreed.

Jeanne went back to the desk, took three sheets of paper from the top drawer, and held them out to him. "We have a piece of unfinished business," she said. "I've had these sitting here for four years."

He looked at them, remembering the last paper she had given him. His hand trembled as he took them.

"Do you have a dollar on you?" she asked.

"I suppose. Why?"

She offered him a pen. "Just sign at the bottom of each copy, and give me the dollar. Of course if you don't trust me, you can have your attorney look them over first."

"Why shouldn't I trust you?" he asked with heavy irony. Legalese hadn't become any clearer during his absence, but he slowly managed to make some sense out of the thick blocks of print.

The papers were three copies of a contract between Jeanne and him, selling him half of the Littlejohn Company for the sum of one dollar.

He looked up at her. His sight was blurred by the dampness in his eyes.

"I never meant to steal anything from you," she said, her words twisted by her own emotion. "But I had to have total control until the Auto-Med was safely on the market."

"But . . . but you bought my share for a considerable amount of cash. Don't you want it back?"

"Call it conscience money, although there's no way I can ever compensate you for what I did. Besides, it's small change compared to our company's current worth."

Her eyes seemed to plead. "I won't ask you to accept my apology, Bill. But please sign."

Four years of hate for her swelled up inside him, until it threatened to choke him. Only it wasn't hate.

He took the pen, and used a corner of the desk to sign the contracts. Finding a dollar in his wallet, he handed it and the contracts to her. He noticed that her hand was as shaky as his when she signed them.

She gave him a copy. "One for you, one for me, and one for the company records," she said. "Welcome back, partner."

Then she made a fist and swung from the heels. The blow landed squarely on his jaw, snapping his head back, sending his glasses flying. The world became bright lights and throbbing pain as he sagged to the thick carpeting. When the lights and pain subsided a bit, he found the glasses and put them back on. Jeanne was rubbing her hand and wincing.

"Was that for my hitting you at our last meeting?" He regretted moving his jaw, but for some reason the punch had made him feel better.

"No, you idiot!" She glared down at him. "I can forgive the slap—you certainly had provocation. That was for running away."

"Huh?"

"You stole four years from us. Four years! We could have straightened this out and . . . and . . ."

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What in hell did she mean by that? There was still a puzzle piece missing. The most important one.

He got up. "Why did you do all this? The real reason."

"You better know why. Because I love you. I love you so much that I was willing to hurt you and lose you to save your dream of improving medical care."

She paused, then went on quickly. "You're a good man, Bill, maybe even a great man. But your fixation against doctors was like a slow poison spreading through you. It scared me. I'm so glad it's gone."

Now at last he felt victorious. He took her hands in his. "I've loved you for a long time—even when I hated you." He paused, then added, "Have you ever made love while being rocked by ocean swells?"

A smile played at the corners of her mouth. "No, I can't say that I have. Why do you ask?"

"Because I have at my command a sturdy boat and a discreet crew. If we leave now, we can be sailing under the Golden Gate by midnight."

Her response was a long passionate kiss. When they separated to catch their breath, she sighed raggedly. "The sooner the better."

As they started for the door arm-in-arm, he said, "You certainly have the Auto-Med well in hand. I'll have to get busy, if I'm going to hold up my end of the partnership."

"You have something in mind?"

He smiled. The world was a wonderful place in which anything was possible. "Have you ever noticed how much money is spent in this country on veterinary care?" ■

● "The Government are [sic] extremely fond of amassing great quantities of statistics. These are raised to the nth degree, the cube roots are extracted, and the results are arranged into elaborate and impressive displays. What must be kept ever in mind, however, is that in every case, the figures are first put down by a village watchman, and he puts down anything he damn well pleases!"

Sir Josiah Stamp,
Her Majesty's Collector of Inland Revenue

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LURE

Harry Turtledove

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Miocene Italy. To be precise, a swamp in Miocene Italy, in what would be Tuscany ten million years from now, give or take a few thousand. It certainly *smelled* like a swamp, Harvey Cutter thought as he squelched through the mud to check his latest trap.

The smells of mud, stale water, and rotting vegetation never changed much, the hunter thought as he scraped his hipboots one after the other on a branch. Or was that *never would change?* Despite a hundred years of commercial time travel, English tenses remained ill-adapted to the phenomenon.

The branch on which he'd cleaned his boots was part of a myrtle shrub. Maybe an uptime botanist could tell the difference between it and its modern equivalent, but Cutter couldn't. The mosquitoes, he thought resentfully as one bit him on the arm, also hadn't changed much.

But he wasn't hunting plants and he wasn't hunting mosquitoes, even if they were hunting him. He was hunting primates for the San Diego Cenozoic Zoo, and he wasn't having a whole lot of luck.

Things had been easier on his last run, when he'd brought back a dozen *Notharctus*—plenty to start a breeding colony—from Eocene North America. *Notharctus* looked like a lemur and wasn't much smarter than a squirrel. He could have caught a hundred if he'd wanted them.

Now he was after larger—and smarter—game. Hominoids, even offbeat Miocene hominoids like the ones he was after now, were nobody's fools. That wasn't surprising; people and the great apes were the survivors of the hominoid clan.

Something squealed in pain and terror, out on the firmer ground further east. Cutter's head whipped round. A *Diceratherium* was down and kicking, with several wolfish *Cynodesmus* scrambling over its bulky body and already beginning to feed.

Cutter was glad *Cynodesmus* preferred dry ground. They would have attacked him just as cheerfully as they had the big, rhino-like *Diceratherium*. They had no fear of man. In the Miocene, primates—any primates—were prey, not predators.

Calling *Cynodesmus* wolfish and *Diceratherium* rhino-like did not really do the beasts justice, Cutter knew. Unlike the plants and the bugs, Miocene mammals resembled their modern equivalents about as much as would clay models made by a talented ten year old with a little more imagination than he really needed.

As if to prove the point, a small herd of *Syndyoceras* daintily picked their way around the gorging pack of *Cynodesmus*. They looked something like deer, something like antelopes, with their striped hides something like zebras, but they had two horns above their eyes and two more halfway down their noses, which made them different from anything that had got past the Pleistocene.

Cutter squelched on. He could see the stand of willow where he'd set his new trap. He could see the net too, undeployed and empty. He said something rude under his breath. He got up to the trap, saw footprints by the fat juicy red apple he'd set out as bait. They were

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the right kind of footprints. He said something rude out loud, loud enough in fact, to scare a flock of Miocene more-or-less sparrows off their perches. They flew away, chirping angrily.

"Hell with it," he said out loud. He looked around for a reasonably dry patch of ground, took out a ration pack, and ate lunch. He scattered paper and cellophane over the landscape with reckless abandon. All the wrappers were aggressively biodegradable; none of them would show up in the seam of lignite that memorialized this landscape in the distant present.

Temper somewhat restored, he examined the footprints round the snare again. They were the prints of his quarry, all right: marks about half as big as his own bare feet would have made, and of the same general shape. The imprints of the beast's opposable great toes, though, were slightly set off from those of the others, and not quite in line with them. Only men and their immediate ancestors had feet fully adapted to walking erect.

The hunter started off toward the next stand of willows, a couple of miles away. That one was bigger than this little outpost, and held his camp and three traps. None of them had caught anything either, though one had been robbed the day before yesterday.

Several sluggish streams ran between the two copses. Cutter forded them with care. The other day, he had watched a crocodile drag a young ancestral hippo off a streambank and into the water. He corrected himself: the little hippo hadn't lived long enough to be ancestral to anything.

He got to the base camp without being bitten by anything more ferocious than more mosquitoes. Then he checked his traps in this stand of trees. They were all unsprung, though two of them had fresh prints nearby. No wonder the Italian hominoid had a reputation for being hard to catch, Cutter thought.

He found droppings under a big, shaggy willow, and set another trap there. When he suddenly looked up in the middle of the job, he saw brown eyes watching him through the leaves. A moment later, they were gone.

He walked back to his camp. That was really too dignified a name for it, he thought. It was just a clearing where he'd pitched a light tent to keep the rain off his sleeping bag. The sun was still in the sky, but he decided to eat anyway.

He got out another ration pack. But for the degradable packaging, he knew, the packs were adapted from old military food: P-rations, T-rations, something like that. He didn't remember the letter. If they'd made soldiers eat stuff like this all the time, he thought disparagingly, no wonder nobody'd fought a war in a long time.

He threw away the cup of what, for lack of a suitably noxious word, was called stew. "What dessert comes with this pack?" he wondered, feeling rather like Little Jack Horner. Instead of a plum, however, he pulled out a cellophane package with four cookies in it.

Sighing resignedly, he started to eat one, then stopped and gave it a long look. "Be damned," he said, and started to laugh. He glanced back toward where his traps were set, looked at the cookie again. "Why the hell not? How could it make things go worse?"

* * *

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Harvey Cutter's nostrils twitched as he walked toward the new exhibit. "Be damned," he said. "It even stinks like Miocene mud. Good job."

Lucy Durr beamed at him. She was second assistant curator in the Primates section of the zoo, and had designed the enclosure. "Glad you approve," she said. "The photos you gave us helped a lot in putting it together."

"Good. I hoped they would."

Lucy put her hands on the rail, leaned on it as she peered across the moat at the pair of brown-furred creatures on the far side. "They're interesting beasts, Miocene hominoids that aren't part of the dryopithecid group that led to the great apes or the ramapithecids humans are descended from. They're just—by themselves. I'm glad we have them. Hardly any zoos do."

"I believe that. They're bloody hell to catch. From the fossils, they're supposed to have been common around here. You couldn't prove it by me. I saw one in a tree for half a second, and I finally managed to catch these two. Other than that, forget it."

Cutter reached into his pocket, pulled out some cream-filled chocolate sandwich cookies, and threw them across the moat to the animals he'd captured. The beasts were nimble enough on the ground. On all fours, they hurried over to the cookies. They grabbed them with hands not much different from Cutter's and greedily gobbled them up.

Lucy clucked the horrified cluck of any zookeeper who catches a visitor feeding the animals. Then she glanced over at the hunter. "How do they know those are good to eat? They haven't had any here, I know that, and they certainly never had any back in the Miocene."

"Oh, but they did," Cutter said. Now Lucy was frankly staring at him. He went on, "I wasn't having any luck with fruit for bait, and so—"

"You tried something else. Sure. But why cookies?"

He grinned at her. "Well, what would you use, if you were going after *Oreopithecus*?" ■

Child's Lament

● You win some, you lose some, and some get rained out, but you gotta suit up for them all.

Jerry Buchmeyer

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THROOP'S

Toward a brighter future . . . .

"All the stories are true," the man told the boy. "I've only changed the names and circumstances, out of consideration for some of the people involved."

"But, Daddy, how can they be true? Nobody really *acts that way!"*

The man's face grew long and serious. "They did once. Pay attention, son; and listen. It's important that we never forget. You're too young to remember the day it happened; but I was there."

Benny Lloyd looked up from the

William R. Warren, Jr.

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REVENGE

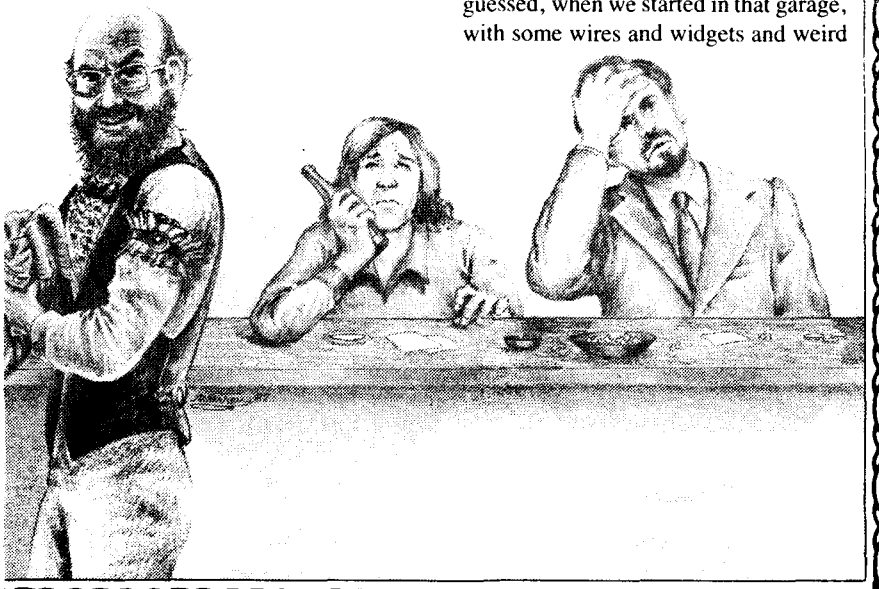
Rowland Shew

computer display with a big smile on his face. "We did it! A 170% increase in sales; a 200% increase in profit!"

Marie Daniels pulled the bottle of champagne out of the bottom desk drawer, where she had been saving it against this day. She popped the cork with a loud bang and poured drinks for both of them. "Here's to the best year, ever!"

"Yeah. Thanks to the money we raised through the stock issue, we were able to expand to meet all those orders."

Marie smiled. "Who could have guessed, when we started in that garage, with some wires and widgets and weird



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ideas, that we'd become the hottest item on The Street?"

They were still drinking toasts when Jim Nugent, director (and sole employee) of the R&D department walked through the door. His face was pale. His hands were shaking.

"What's wrong?" they asked.

"Haven't you heard?" He threw a copy of the *Journal* onto the desk. "We're being taken over. Blackbeard, Morgan & Kidd, the arbitrageur firm, bought up 51% of our outstanding shares at bargain prices this morning. They're our new bosses."

"What!?" They were shocked and outraged. "How can that be?"

Nugent shrugged. "Our stock skidded. Dropped 50% in one day. BM&K saw an opening and went for the jugular. The *Journal* says they plan to sell off our assets to recoup their investment."

"Investment?" sneered Daniels. "An investment is where you back a firm because you believe in its future!"

Lloyd shook his head. "Wait a minute! I don't understand. How could our stock drop when we just announced our best year ever? I mean, profits were up 200%!"

"That's the problem. The financial experts on The Street had predicted an increase of 250%. We just didn't measure up to their forecast."

"Wait a minute! Are you trying to tell me that because those financial clowns made a faulty forecast that *our* stock drops?"

"Money managers are never wrong," said Nugent morosely. "Only the companies are wrong when they don't do what the money people thought they should have. When our stock dropped, we became 'undervalued.' Our assets were worth more than the price of our stock, so . . ." He shrugged. "Is there any of that champagne left? I need a drink."

"No, it's gone; but there's a bar just down the end of the block." He looked around the office and the assembly area sadly. "I think we all need to get out of here."

"Why, what is it you're trying to ask me, Bill?"

Bill Reilly ran a nervous finger around his collar. He took a quick look around campus to see if anyone was watching. "Well, Betty Lou, uh. . . . A bunch of the guys in the chem lab, uh, well, they're cooking up a, well, party, and . . ."

"Hey! Lookit here! A nerd!"

Bill's head jerked up. Two brawny guys in varsity sweaters had pulled up to the curb in a white convertible. The driver spoke. "Hey, Betty, you don't wanna go to a nerd party, do you? Be surrounded by a buncha freaks wearin' calculators on their belts."

"Yeah," his companion said. "They'll probably wanna talk about atoms or die-no-sours or sumpin. Whyncha come to the frat house? Gonna be a great bunch there. Most of the football team. All the real party animals."

"Yeah, c'mon, Betty," the driver added, with just a hint of menace in his voice. "You don't wanna be seen with the *wrong* crowd, do you?"

Betty looked from the jocks to Bill. She seemed embarrassed. "Uh, it was nice of you to ask me, Bill; but I've . . . well, I've made other plans."

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Then she walked to the car—almost reluctantly, it seemed to Bill—and got in. He wanted to yell after her. Hey, you've got a *brain!* Why do you waste your time with them? But he didn't want to embarrass her further.

"So long, nerd!" cried the driver.

"Yeah, so long, nerd!" his companion added, and laughed at his witticism.

Bill felt his face blushing. One or two other students paused and glanced at him curiously. *The hell with this,* he thought. *I need a beer.*

John Reginald clasped his hands on his desk and faced the two visitors from Corporate. He could never tell them apart and couldn't remember their names; but that didn't matter, since they were interchangeable anyway. Mentally, he dubbed them Mr. Left and Mr. Right.

"So, how was your tour through the plant?" he asked.

The one on the left spoke. "The supervisor in—what was it?"

"Tablet department," said Right.

"Yes, Tablet department."

"You mean Mike Long?" Reginald was pleased. They had picked on his best department. "Long's a good man. He's the best supervisor I've got. His quality is tops; he has the lowest rate of chipped and off-weight tablets of any plant in the company. His production is highest; he meets sales orders on time with the right quantity. And of course, he's a great people manager. Lowest turnover and absentee rate in the company. No union grievances in the last two years. What about him?"

"Fire him."

"Fire him?" Reginald shook his head to clear it. Had he heard them correctly?

"Yes. Fire him."

"But . . . Why?"

They answered him in tandem, like antiphon and response. "When we saw him, he was out on the production floor," said Left.

"He didn't have his suit jacket on," said Right.

"His tie was loosened," said Left.

"His shirt sleeves were rolled up," said Right.

"He was talking with the *hourly employees,*" said Left.

"But . . . But . . ." Reginald sputtered. "He gets *results!*"

"That's the problem," said Right. "With performance like that, he is sure to be promoted into management ranks."

"And he just doesn't dress right for a management job," said Left. "Doesn't conform to the Corporate Image and Corporate Dress Code."

Reginald thinned his lips. "And that's more important than smooth, trouble-free operations?"

For the first time, his visitors looked puzzled. They glanced at each other, then back at the plant manager. "Of course," they both said together. "Don't you think so, too?"

For five minutes after they left, Reginald sat at his desk, deep in thought. Then he sighed and picked up the phone and dialed. "Mike?" he said. "How 'bout you and me go out for a drink? There's something we need to talk about."

"But, Senator, it just won't work that way!" Bart Kimball leaned over the microphone on the witness table.

"Well, son," said the senior Senator from the midwest, "why don't you let

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us be the judge of that. If dedicated men and women are determined enough to make something work, why — somehow — they'll find a way." The other members of the aerospace subcommittee nodded, some of them in their sleep.

Kimball gnawed his lips in frustration. The spaceplane design was a beauty. It went all the way back to the old X-20 DynaSoar concept, with the Orbiter piggy-backing on a manned and reusable Lifter. The X-20 had been shelved in favor of the Spam-in-a-can Mercury capsule because a cheap, disposable capsule seemed the fastest way to Beat the Russians to the Moon. Later, it was shelved again in favor of the Shuttle, the argument being that the Shuttle design was cheaper. Sure, cheaper to *build;* but not cheaper to operate. Hadn't these politicians ever heard of life-cycle costs? No, of course not. They were all lawyers, mostly, with no contact with physical reality.

They honestly believed that if you wanted certain performance requirements, all you had to do was pass a law saying This Is What The Hardware Must Do. That was fine as far as it went— "specs is specs." But they thought funding was a totally separate matter!

Here's what we want you to do. Here's the only money we're going to give you to do it. Somehow, they believed, someone would find a way to do it. And of course they would. By backing off on performance. By compromising the design. That's how they got a Shuttle with jointed solid fuel boosters. Though no politician ever took any of the heat because their penny-wise funding forced a no-margin-for-error design.

Now they were at it again.

"You'll simply have to cut out some of the fat and gee-gaws. You can't expect us to give a bunch of engineers a blank check drawn on the taxpayer."

Why not? Kimball thought sourly. *You give one to everyone else.* The entire space program could have been funded from the cost *overruns* of the Pentagon budget.

The Senator looked around the committee table. "Then, I think if we're all agreed, we'll recommend funding the spaceplane project at one-half the proposed budget, with the provision that the spending be equitably disbursed in, ah, all regions of the country."

Right. It's not the building of a spaceplane, a genuine, honest-to-God spaceship that matters. It's whether enough of the spending gets spent in the home district. The whole Space Enterprise was just high tech pork barrel to these types.

With one or two exceptions. He saw one Senator, the one who had been in the Program herself, shrug her shoulders in resignation. She gave Kimball a half-a-loaf look and raised her hand along with the rest.

Kimball sighed and packed his briefcase. All the useless specifications and drawings and costings that meant less than nothing to the people he had come to deal with. He glanced at his watch. If he hurried, he could catch the next shuttle flight from National Airport and hit his favorite bar before he went home.

"But you've taken everything I have!" she told the man from the IRS.

"It's money you owe the Govern-

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ment, Ms. Powell."

"How can I owe the government $200,000 in taxes? I never made that much money in ten years!" She twisted the handkerchief in her hands and looked around the plastic-and-steel furnished office. Dozens of little cubicles, just like the one she sat in. Each with a free citizen of the United States trying to explain why they were innocent of the charges against them."

"When you don't declare all your income for several years, the Government levies back taxes *plus* interest *plus* a penalty. Now, how do you intend to pay the remainder of the assessment?"

"But you've garnished my paycheck. You've taken my bank account. *You've taken my eight-year-old daughter's bank account*. She was saving her nickels and dimes. I couldn't make my house payments. I couldn't make my car payments."

"Will you pay it in quarterly amounts or monthly?"

It suddenly occurred to her that the man in front of her was not listening. Everything she said was falling into a vast empty pit. He knew what he was going to say and was only waiting for her voice to stop so he could say it.

"I can't pay you anything. When they repossessed my car, I lost my job! The bank took my house back. For thirteen years, even after Jim died, I never missed a payment. Now I have nothing. I've had to move in with my parents."

For the first time she saw evidence that he was listening. "Oh? How much is *their* house worth?"

Suddenly, she just wanted to get out of there. The man from the Government would keep after her and after her until she signed the payment agreement. If she signed it, she still couldn't pay, but at least it would get them off her back for a while. She picked up the form and began reading it.

"You do know that the commissioner has ruled that if a person stays rent-free or for only a token rent in their parents' home, then the difference between what they pay and the median rent in the area can be considered income for the purpose of taxation."

"Wait a minute!" She shoved the form on the desk and pushed it under his nose. "This says Mary *Ann* Powell. My name is Mary *Agnes* Powell. And my husband was named *Jim* not *John*. And he's dead, not divorced. What is this?"

The IRS man picked up the form and studied it. "May I see some identification?"

She showed him her driver's licence. The IRS man studied it; compared the photograph to her; frowned at the change in hair styles; checked the name on the license against the name on the form. Then he returned her license to her; stacked the forms up neatly and returned them to a pale manila folder. He clasped his hands into a ball on the desk and smiled at her.

"Well. Never mind."

She had staggered no more than two blocks down the avenue when she saw the flashing neon sign in the window. *It's the middle of the afternoon*, she thought, *but I sure as hell need a drink*.

Karen Lonsky walked into the staff meeting and they all turned and looked at her. It was unusual enough for Qual-

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ity Control to be at the staff meeting; it was even more unusual for them to listen to what Quality said.

"Well?" said the plant manager. "What are the results?"

"We took a random sample of 200 toasters from the stock in the warehouse and tested each one for function. We found 30 of them to be defective."

"Only thirty?" said Material Management. "Then what's the problem? There are 35,000 toasters in the warehouse."

"No, that's thirty out of the 200. Or 15%. That means there are about 5,250 defective toasters in all."

"That can't be right," said Production. "Your sample probably found all the defects, that's all."

Karen stared at him. How could an otherwise rational human being say something as absurd as that. You grabbed a handful of straw and found the only needles in the whole haystack?

Engineering looked at her. "Can they be fixed? The defectives, I mean."

"Yes. It's only a matter of resoldering one wire."

"Wait a minute! Wait a minute!" It was Accounting. "We can't do that!"

Karen frowned. "Why not?"

Accounting took out her pocket calculator and hit buttons frantically. "You say there are 5,250 defective toasters?"

"Plus or minus 2,651."

"Can't you be more precise than that?"

"Not without taking a larger sample. The percent defective is no lower than 7.5% and no higher than 22.5%"

Accounting frowned. "Why can't you simply make the smaller sample more precise?"

She wanted to say, because I'm not a creative accountant. I can't make numbers mean whatever I want them to mean. A simple random sample has a certain built-in precision and neither you nor I can change the way the universe is put together. But, not being entirely without political wits, she kept her peace.

Accounting had not really waited for an answer. The question had been purely rhetorical, designed to show that Quality could give better answers if she really worked at it. No one ever questioned Accounting data. Which was just as well. "Well, let's say it's 22.5%. How long will it take to repair each unit?"

Karen looked at Production, who said, "Between five and ten minutes each."

Accounting nodded. "So, 7,901 units at ten minutes each at $10.00 per hour labor and overhead burden, is . . . $13,000! Add, say, another $13,000 to inspect all 35,000 in order to identify the defectives. That's roughly $26,000 to repair."

The plant manager frowned. "What other option do we have? We can't scrap the defectives because we don't know which units are defective until we inspect; and if we do that much, we might as well fix 'em."

"No," said Accounting. "Don't scrap them and don't fix them. Ship them."

Production nodded. "Sounds good to me. That way I meet my production quota for the month."

Karen's jaw dropped. "Ship them? The defectives?"

"Why not? You said yourself that as many as 92.5% could be good. Suppose

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only 2,600 toasters are bad. What happens? History shows us that only one person in twenty will bother to complain. That's 130 complaints. Okay, we give them a free toaster to make up for it. That's $2,600. The other 2,470 have a defective toaster. They don't complain, because it's only a $25 item. They just trash it and go out and buy a new one, *and we make $5 profit on each replacement they buy*. So, $12,350 minus $2,600 to satisfy the whiners gives us a cool $9,750 profit. Versus $26,000 extra cost if we do it your way." She looked at the plant manager. "I'd say the choice is pretty clear."

Karen couldn't find her voice. Accounting had calculated one set of figures using worst case assumptions and the other set of figures using best case assumptions. Not only that, but the labor and burden she had charged against the sorting option was money that would be spent anyhow. Those people would remain on the payroll regardless of the decision. But worse than that was the assumption that a customer who received a defective toaster would go out and buy a replacement. Sure they would—*but whose toaster?* In a couple of years Corporate management would be down in Washington screaming about unfair Japanese toaster makers.

But she knew it was useless to argue. Accounting was an MBA and so was the PM. They talked the same language. The language of financial abstractions. Somehow, in talking dollars, they forgot about toasters, and customers.

She shuffled her useless sampling data into a neat pile. *Christ*, she thought. *I need a drink.*

* * *

The bar was crowded when Bart Kimball entered. The flight from Washington had worn him out. He looked around. All the booths and tables were occupied. There was a college student nursing a beer at the bar next to two corporate manager types. Seeing him look around uncertainly, some people at one of the tables waved him over to join them.

"Thanks," he said shoving his briefcase under the table. "Name's Bart Kimball."

The man shook his hand. "Benny Lloyd," he said. "This here's Jim Nugent and Marie Daniels. We make room temperature superconducting logics. . . ." He grimaced. "At least we did until this morning."

Bart waved to the bartender. "Make it my usual," he said. "And another round for my friends here." He turned back to the group. "I guess we all got troubles. I was in front of a Congressional committee all day trying to get enough money to build a decent spaceship."

"A spaceship?" said Nugent. "Not the Spaceplane project? How'd it go? Geez, if only we could do our manufacturing in zero *g*. . . . Those superconducting alloys are pretty sensitive to trace impurities."

"Could have been worse, I guess. We got half of what we asked for."

"Half?" said Marie. "We'll end up with another Shuttle, full of design compromises and half measures. And you know where *that* led us."

The door slammed open and a short, chunkily built female strode in. She marched straight to the bar and plunked herself on a stool.

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"Schooner. Draft," said Karen. "Tall and cold."

The bartender brought her one and she stared moodily into it. "What a bunch of idiots," she muttered.

"Oh, there's no shortage of them. Which particular bunch did you have in mind?"

She looked up. The bartender was standing there, polishing glasses with a bar rag. She grimaced. "The Accountants, who else."

"Ah, the accountants," sighed the bartender. "God love them, for no one else shall." He pointed to the rack of peanuts on the bar. "My accountant proved to me that if I had that rack of peanuts, I would lose money on every package I sold."

Karen frowned. "How come?"

"Because the peanut rack carries a share of the overhead burden. A fraction of the cost of the soap in the washroom gets charged against the peanut rack, along with a fraction of all my other costs, because the peanut rack is . . ." He shaped the words lovingly with his lips. ". . . a profit center." The bartender shook his head. "I've done a bit of this and a bit of that in my time. But 'tis a good thing I never studied accounting. I made a lot of spare change with those peanuts before I found out they were a money loser. That's why I do my own accounting now."

"Yeah," Karen agreed. She lifted her schooner. "Here's to the Accountants." She turned on the room as a whole. "Here's to the Accountants!" A chorus of boos and catcalls responded.

"And here's to the lawyers!" said a man in the corner of the room.

"That's Jim Bennet," the bartender told her. "His youngest son went bad. Turned to drugs and petty crime to support his habit. Now he's suing him."

Karen looked at the bartender. "Suing? Who?"

"His son is suing him. For parental malpractice."

Karen set her schooner down with a thud. "You're kidding me, aren't you?"

The bartender shrugged. "Could I make up something like that? With that sort of imagination I could write science fiction." He blinked and looked off in the distance. "I could write about my true life adventures, but people would think they *were* fiction."

"The hell with lawyers," said a man at a table in the center of the room. "Here's to the politicians!"

"And the money managers!" chorused the three people with him.

"And the professional managers!" added two men sitting next to Karen. "And the jocks!" said the student. The bartender introduced them as John Reginald, Mike Long, and Bill Reilly. They traded stories with one another.

"Don't forget the IRS," said the woman in the corner. "You're guilty unless proven innocent. They harrass you and take you for all you're worth. You lose everything you ever worked for. Then, when they find that *they* made a mistake, they don't even say Sorry. All I'll get back is the cash value of what they took. Not the house. Not the car. Not the job."

John Reginald turned back to the bartender and raised his glass in salute. "At least we can depend on barten-

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ders," he announced.

"Hear, hear!" said the room.

"Oh, I'm not a bartender by profession. I just took the job so I could meet folks like yourself. Years ago, I was a . . . bureaucrat."

Everyone hissed. "Yes, 'tis true. For the Canadian government, out in the Northwest Territories. One day, I could stand it no longer. I cracked up. I answered all my mail as directly and honestly as I could. Told them all exactly what they could do. Then I packed it in and vanished. Later, I ran a small electronics company trying to do business with your government. I edited a small technical publication. Answered the mail for a well-known science fiction magazine. Worked as a quality manager and at the U.N. Sometimes I used a *nom de guerre*. Everywhere I've gone I've tried to make people see the error of their ways."

Reginald shook his head. "A noble quest," he said. "Sometimes I think if only people could listen to what they were saying they would realize how *irrational* they were."

"I'm afraid the powers of rationalization are stronger than the powers of rationality."

"There must be something we can do!"

"That's right!" said Bart. Benny, Marie and Jim echoed in. "Yeah! Let's do something."

The entire room chorused their agreement and determination. They turned to the bartender, as if he were their natural leader. Karen asked the question for all of them. "But what *can* we do, Mr. . . ."

The bartender stuck out his hand. "Throop," he said. "Kelvin Throop. And I have a plan."

The noise came from far away but seemed to be growing louder. The man frowned and left his dinner table and walked to the front porch. He looked down the road. What was that? A crowd of people? It was, and they were coming closer. A parade? He heard the sounds of thousands of cheering voices.

They were carrying things. Hundreds of great black shapes hogtied to rails and speckled with white. Tar and feathers? That's what it was, tar and feathers!

Then, when the crowd had come closer, he could see *who* it was who had been tarred and feathered. And they were all there, every last mother-lovin' one of them! He turned and ran into the house and grabbed his son by the wrist. "Come, quick! All of you," he told his wife and daughter, "you've got to see this!"

They crowded onto the front porch and watched the parade. As each tarred-and-feathered shape went by they applauded. He felt a welling of triumph within. Things were going to be better from now on. People were lining the road now, cheering and waving their arms in the air. Children ran along the side of the parade, laughing and jumping. Somehow, the sun seemed brighter and the air more clear. Tears of joy sprang to the man's eyes and he knelt by his son. "Take a good look, boy. Take a good look. This is the start of a new and wonderful age." ■

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the reference library

By Tom Easton

Still River, Hal Clement, Ballantine/Del Rey, $16.95, 280 pp.
The Legacy of Heorot, Larry Niven, Jerry Pournelle, and Steven Barnes, Simon & Schuster, $17.95, 367 pp.
An Alien Light, Nancy Kress, Arbor House, $17.95, 371 pp.
The Architects of Hyperspace, Thomas R. McDonough, Avon, $2.95, 265 pp.
On Stranger Tides, Tim Powers, Ace, $16.95, 325 pp.
The Secret Ascension, Michael Bishop, TOR, $16.95, 339 pp.
Isaac Asimov's Robot City, Book 2: Suspicion, Mike McQuay, Ace, $2.95, 178 pp.
Saga of the Swamp Thing, Alan Moore, Stephen Bissette, and John Tottleben, Warner, $10.95, 184 pp.

Astounding/Analog has long been renowned as the bastion of "hard" SF, meaning SF that takes its science seriously. "Hard" SF stories hinge upon some scientific detail, preferably one that isn't too well known, so that the author can both surprise and edify the reader. A sub-genre is that of the world-builders, who use the unforgiving laws of nature to build worlds that defy our expectations, or that fulfil them in unexpected ways. Often enough, the author stops the story periodically for lectures on how bleeding hearts make no never-mind to the cold equations of reality.

If we have "hard" SF, we must also have "soft" SF.[1] That began in the thirties and forties but became vigorous only in the fifties, when certain editors apparently wished to define themselves and their magazines as something *other* than John W. Campbell, Jr., and *Astounding*. They abandoned the brass tacks and rivets then, and loosened their

[1]It's one of those cold equations—we never apply specific descriptors such as "hard," "hot," "rough," or "tense" unless we have an at least implicit comparison to make, preferably with an opposite.

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grip on reality. The equations were no longer so cold. Characters, psychology, and sociology became more important. And today, "soft" SF—let's include fantasy in this particular peach basket—dominates the field.

But "hard" SF is still with us. And the High Sachem of the tribe, the same Hal Clement who gave us, among other fine exercises in world-building, *Mission of Gravity* and thereby did as much as anyone to define "hard" SF, is back, with another new and novel world. That world is the small planet of Enigma, too small to have kept its primordial atmosphere. But keep it it did, and the mystery of how gave it its name. Enigma also orbits a hot, young star and is thereby too young itself to have evolved life. But, somehow, it does have life, and life of mysterious variety.

The life is unknown when the students from Galactic U. arrive for their field exercise, success at which will qualify them for the advanced degree of Respected Opinion. They are of five species, only one human, and their atmospheres are sufficiently toxic or annoying to each other that most must wear environmental suits at all times. This doesn't bother Molly, the human, because humans now live largely in space; most see Earth only near the end of their lives (it seems to have become a retirement world).

Enigma has been used for field exercises for many millennia, and each set of student reports is sealed and forgotten. Each student team must begin afresh to puzzle out how Enigma could possibly have an atmosphere, and Molly's team is no exception. However, they seem to have unusual luck, beginning when Molly falls through a gas geyser into a network of caverns that honeycombs the planet. As she and her fellows explore, they indeed begin to unravel the atmospheric mystery. But they uncover others, including a river that changes its fluid's composition from largely ammonia to largely water, and then to largely rocket fuel (clue: the book's title is a pun). They discover Enigma's enigmatic life and uncover a startling instance of Heisenberg's principle that the observer affects the system observed.

Still River is a puzzle tale in the purest line of "hard," world-building SF. Perhaps not surprisingly, the puzzle—the plot and setting—is dominant over the characters. The latter are strange enough, but characters have never been Clement's strong suit. Thanks to highly effective translator computers that can name an ammonia-blooded, nonbreathing, four-eyed spheroid "Joe," even the most alien of aliens comes across as indistinguishable from humans, and the one human seems quite mechanical.

Clement's game is cerebral, not emotional, even in his underlying theme—that one must be very careful about one's assumptions, about what one takes for granted. If you like to play the same game, by all means go buy the book. You'll love it. If you don't, be warned. Clement will drive you up the wall as you wait for some character to feel something more profound than "Aw, shucks." But then, your expectation of emotional action *is* an assumption. Some folks, like Clement (maybe), live more mental lives, and the world is richer for them. As he might say, "Emotions are ancient and inescapable things; they are always with us. Intelligence is a recent invention that people can avoid using too easily. Sadly, many do."

Larry Niven, Jerry Pournelle, and Steven Barnes seem to see people in a more holistic way, saying that even

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highly intellectual folks can get so scared they mess their pants (though it seems to help if a little Hibernation Instability—residual damage suffered when interstellar colonists are thawed from cold-sleep—impairs the cerebrum). Humans, they say, are both mind and gut, and there is a place for both in their lives.

The tale is **The Legacy of Heorot,** and you know the basic plot if you remember the *Beowulf* you read in college. Heorot was a hall of heroes to which a monster, Grendel, came at night to choose his meals. To this occasion rose Beowulf, King of the Geats; he pursued Grendel to the depths of the mere in which he lived, slew him, and brought back his arm to nail above the entrance to Heorot. And then came Grendel's dam, seeking revenge, and Beowulf had the strenuous task to do all over again.

Now Heorot is a world, Avalon, to which has come Earth's first extrasolar colony. The colonists are the cream of Earth's crop for stability (though there has appeared that Hibernation Instability), intelligence, skills, and sociality. Among them is but one soldier, Cadmann Weyland. He is the colony's security chief, there against the possibility of need. But no need appears, and in their complacency the colonists ridicule his efforts to protect them. This is enough for the astute reader—disaster is inevitable, and it must take the form of a Grendel. And there is Weyland's name, which aptly recalls the Cadmus who sowed the dragon's teeth and thereby primes the reader for the eventual solution to the colony's Grendelian problem.

That problem is implicit in Avalon's environment. The colony is on an island virtually devoid of life, though the mainland teems with beasts of every description. The island has nought but thornbush, things like rabbits with teeth, and samlon, fishlike and delicious. There is also the Grendel, territorial, curious, *hungry,* and FAST. It takes a dog, and a chicken. Weyland lobbies for better security and is ridiculed again. It takes a calf, and the colony panics. It takes a baby, and then a man, and Weyland becomes inadvertent bait. Others kill the monster, and Weyland, angry, retires to the mountain with his woman. The colony is at peace, and though its guard is up a bit, it quickly regains complacency.

Then Mama comes. But the colony is wiser, and it takes much less damage. Weyland now gains the recognition he deserves and promptly leads a successful hunt. Then he develops means to winkle out other grendels from their meres and slays them. And soon thereafter, the colonists twig to the grendels' true role in the colony, the true nature of the samlon, and the true prospects for their survival. I will only say that the grendels' life cycle is modeled on that of a nasty, nasty frog and remind you of Cadmann's name.

Legacy is a very different sort of story than what Clement writes, and I can't help but wonder what Niven, Pournelle, and Barnes might have done with Enigma. I suspect they would have produced a much more dramatic tale, and that we might in time have gained two marvelous films. As things stand, I suspect we will get only one, though that one will be a corker. *Legacy*—with all its monsters, the gore, the mightily thewed and scarred hero, and maidens fair—seems tailor-made for the big screen.

But *Legacy* is also as fine an example of "hard" SF in the adventure pattern as I have ever seen. The puzzle is there, the cold equations that can confront a

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hero or a novelist with a quintessentially dramatic situation. But it has the characters as well; they are distinctly human, rounded out with anxieties and suffering and as confounded by romance as anyone could wish. Don't miss.

With her first SF novel—after three fantasies—Nancy Kress makes a strong bid for the 2008 Grandmaster Nebula.[2] The novel is **An Alien Light,** and it falls somewhere between *Legacy of Heorot* and *Still River*. It's hard SF, on the puzzle side, but there is a touch of action (though it is less feverish than in *Legacy*) and plenty of emphasis on the characters.

Humanity is at war with the Ged, three-eyed humanoids whose minds work slowly and rationally, like the minds of all other civilized species. The Ged are baffled by an apparent paradox: Species that evolve rapidly from savagery, and whose minds also whiz, invariably destroy themselves before discovering the stardrive. Humans did not, and they thereby defy the rationality by which the Ged set great store.

The situation obviously calls for a research project. Happily, there is a quiet backwater world settled by the survivors of a human shipwreck millennia ago. The humans, upon whom Kress constantly and mercilessly keeps her focus, are divided into two city-states, the Delysians, soft and bargaining merchants, and the Jelites, hard and dedicated militarists. Call them Athens and Sparta, if you wish; and you are close. But then, as Kress leads us after her exiled Delysian heroine, Ayrys, we learn that the Jelite warrior-priests wear a double-helix badge and come the closest to Athenian intellectuals.

The Ged build a mysterious city on a hilltop and invite the locals to apply for entrance. Ayrys, Dahar, (a Jelite warrior-priest), and many others are accepted. Once inside, they find that the Ged want to teach them what to the Ged are the rudiments of science and technology. But the Ged teach in a particular way—they teach the art of questioning, of hypothesis and experiment, in short the scientific method. And a very few human minds—Ayrys's and Dahar's among them—catch fire. In fact, they catch fire so thoroughly that in time they see through the lies of the Ged, and. . . .

The story is a portrait of a society of fragments. Delysians and Jelites, curious and incurious, thinkers and nonthinkers, questioners and accepters, all enclosed in a pressure cooker and left to stew. To the Ged's astonishment, enemies become allies, friends, and lovers, and *vice versa*. Conflict soars, and in this environment, the minds of the human intellectuals burn with a clear, bright flame. Where the rational Ged are possessed by the paradox of humans in space, the humans are possessed by less abstract concerns—power, place, and price. They are capable of obsession with puzzles, as witness the response of Ayrys and Dahar to an itching plague, but the emotional, nonrational traits of character drive even that obsession. And to add insult to injury, from the Ged's point of view, they have minds that can leap beyond the strictly linear sequences of pure logic.

Have I told you too much? I hope not. I have said nothing about why Ayrys was exiled, or why the Jelite sister-warrior Jehane saved Ayrys's life, or what the albino giant from the Isle of the Dead was doing there, or. . . . But that is plot, the action I said was there, and it is only the trappings with which Kress chooses to adorn her theme—that

[2]Why 2008? She's just a kid now, and Grandmasters have to have *lots* of grey hair.

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it is the way we think that makes us distinctively human, and that those who think and those who refuse to think, and perhaps those who think too much, are very different sorts of beings. At the same time, she says, there is a very productive tension among these subspecies of our kind.

Don't miss this one. Kress is bound to be high on the next round of award ballots.

For a change of pace, let's look briefly at Thomas R. McDonough's **The Architects of Hyperspace.** McDonough would have it that twenty years before his story, an expedition from Earth finds an immense construction surrounding a neutron star. It is the first remnant of an extrasolar civilization to be found, and it kills its discoverers. Fortunately, one of them first gets off a message to his wife and daughter on Earth.

That daughter, Ariadne Zepos (the name seems deliberately chosen), is an archeologist who would love to explore alien leavings. Because she also can't keep her mouth shut, a pair of slick and well connected connivers decide to beat her to the treasure-trove, and their maneuverings do a lot to drive poor Ariadne into shipping crates and rattle-trap starships. She has help from an unlikely Irish/English pair of starbums. And eventually, of course, virtue and romance triumph.

It's hard SF, for there is plenty of physics and engineering here. Sadly, there is also some biology, which McDonough gets thoroughly wrong (he doesn't know the difference between a virus and a bacterium). I expected much better of someone who has advised Pohl, Niven, Pournelle, and Godwin on their science, coordinated the Extraterrestrial Intelligence Program at The Planetary Society, and worked at the Jet Propulsion Lab, even if he isn't a biologist.

It's action-adventure SF, too, but the perils of Ariadne are stale stuff, done to death forty years ago. And McDonough plays them all for yocks. Maybe he's trying to have a little fun with some of the genre's clichés, but his hand is too clumsy or the clichés are just *too* dead. It doesn't help that the characters are stereotyped cardboard of the thinnest cut.

Is it any wonder that I couldn't get past page 76?

Tim Powers. I say the name, and you recall with pleasure *The Anubis Gates* and *Dinner at Deviant's Palace.* You wonder what marvel he could possibly have come up with now, and whether it could possibly top his first novels.

On Stranger Tides is the new marvel, and if it doesn't top *Gates* and *Palace,* it is still excellent fare whose defects are too trivial to specify. In subject matter, it is closer to *Gates,* for it offers us an eighteenth-century Oxford don obsessed with bringing his late wife back to life. He has taken to the study of magic, learned a number of useful spells, and found that though magic is weak in the Old World, it remains strong, as *voudon,* in the New. On his first research expedition, he loses an arm. On his second, . . .

Our Hero, John Chandagnac, ex-puppeteer, is sailing to the West Indies to seize justice and wealth from his scoundrel uncle. Aboard his ship are a strange, one-armed professor, his lovely daughter, and her obese physician. The dinkiest of pirate ships attacks. The professor and the physician traitorously slay their ship's crew. John perforce turns pirate. And soon he learns all—the prof is in league with Blackbeard, who is both

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pirate lord and magician; together they will journey to the Fountain of Youth, and in due course, the prof will bring back his wife to occupy the vacated body of their daughter.

Now hero John must somehow get back on his uncle-seeking track and save the fair maiden. Can he do it? There are reports that his uncle is dead, and his love vanishes. Blackbeard himself is in the way, and ships manned by zombies, ancient ghosts, and the Royal Navy.

Worse yet, there is the bottom of the rum bottle when all seems lost. But John rallies for a climax worthy of Errol Flynn or Tarzan, and the reader ends the tale with a sigh of satisfaction. As before, Powers has done a bang-up job, and anyone who once loved *Treasure Island* will thank him.

In fact, I wouldn't be surprised if some fan mailed him a hand-carved peg-leg or velvet eye-patch. Would you believe a parrot? A bottle of rum?

Among the several ways for an SF writer to make it big, one of the strangest seems to be tackling religion. L. Ron Hubbard did it with scientology, and we all know what that got *him*. Philip K. Dick did it with gnosticism, and he is rapidly turning into a growth industry worthy of Wall Street.

Or, better, Rome. Biographers and critics alike are hailing him as a saint, and now we have Michael Bishop. In his latest novel, **The Secret Ascension,** he gives us the gnostic credo, "Philip K. Dick is dead, alas. Let's all queue up to kick God's ass," independently received by two widely separated characters. Then he tells us that Dick is literally come again, sent by the local God franchise to save the world while wearing a "resurrection body" that shares certain features with the Cheshire Cat.

Why does the world need saving? It went wrong back in the sixties, when Nixon bombed the North Vietnamese into the Stone Age and went on to second, third, and fourth terms in the White House. Soon known as King Richard, he brought to the U.S.A. "disappearances" for rebels, internal travel restrictions, censorship, and a "Back to Africa" program for blacks. Dick was a renowned writer, but for his early mainstream efforts. His SF was unpublished, except in the illegal samizdat form.

The story centers on Cal Pickford, whose parents were stoned to death as hippies. He works in a Georgia pet shop, while his wife, Lia, struggles to get her private psychological practice off the ground. Events begin to move when Cal reads Dick's obit on the floor of a guinea pig cage. His wife is visited by Dick's ghost, remembering nothing but knowing he must try to "abreact" the current reality and convert it to something more appealing. The ex-actress wife of the secretary of agriculture comes to the pet shop, signs up Lia as her private therapist, engineers the theft of Cal's samizdat Dick novels, and blackmails Cal into coming to work at her ranch. Events conspire, and soon Cal is on the Moon, together with Nixon and Dick's ghost, to take the final, decisive steps toward the world's salvation.

Do you know what "abreaction" is? It means talking out your problems, expressing your feelings and dreams in hope of finding a resolution to your problems. Dick's ghost is using the term in an analogical sense, but Bishop is not, as all writers do not, as Dick himself did not. Writers don't talk, but they do write, and they commonly dwell on the imperfections they see in the world, attacking them with satire, irony, ridicule, tragedy, and. . . . They hope to

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alert and inspire their readers, and so to change the world.

In general, they fail. But they keep trying, until some go crazy from beating their heads against a wall and others talk out not the problems that obsess them but their obsession. Bishop knows this, and he says it. And this makes his book an act of worship for Philip K. Dick, an attempt to give him, as an offering, what Dick never could gain in his own life.

The book is also an abreaction in its own right. Bishop seems quite explicitly to be talking out his grief for a writer he knew and loved.

The second in the *Isaac Asimov's Robot City* series is Mike McQuay's **Suspicion.** Book 1 left hero Derec amnesic and accused of murder in a city populated only by robots. *Suspicion* picks up where *Odyssey* left off. The mystery is intensely present, and when Katherine, the woman who has accompanied Derec to Robot City finds the *corpus delicti,* it lets up not at all. You see, the corpse is *Derec,* or at least a dead ringer for him. But Derec is very much alive, discovering that the city contains what seems to be a central administrative office that is occasionally visited by a human being. There are nightly floods, brought on by the city's mining activities and exacerbated when the city increases its pace to outrun disaster. There are strong hints that Katherine is not what she seems. And. . . .

Last time, I pointed to the aliens, *verboten* in Asimov's Foundation/robots future, as a hint that Derec is a robot simulating a human in order to help the robots discover and understand the Laws of Humanics. *Suspicion's* revelation of extra Derecs confirms my thought that Our Hero is a machine, and the difficulties the robots of Robot City are having with the Laws of Humanics do nothing to change my mind about the nature of what is going on. However, I can add a guess that there is a second group of robots behind everything. One of them, not a human, is the secret administrator (and I'll bet he turns out to look a lot like Derec). They built both Derec and the robots of Robot City, giving the latter the mission of studying the former. And they. . . .

Enough. Why don't you try a few guesses of your own?

Every once in a while, there lands on my desk an example of that modern incarnation of the comic book called the graphic novel. The latest is **Saga of the Swamp Thing,** the tale of a mass of vegetable matter that thinks it is a man and fights power-mad generals, insane vegetable-hybrid botanists, and demons on behalf of poor, suffering humanity. The book reprints actual DC comic books, and it sounds silly. But this one is the best I have ever seen. The artwork is skillful, and with subtle touches, and the writing is levels beyond anything I recall. I enjoyed it.

Yes, there is the grotesquerie that characterizes all horror comics, indeed all comics. But beneath that surface lie a poetic sensibility and a gift for internal and external allusion that would do credit to a literary novelist, or to the screenwriter that is Alan Moore, *Thing*'s British writer. At the same time, there are a story that beats most of what you can find on TV, special effects that may well be beyond the reach of Hollywood, and a perfect portability. Buy the comic for the New York-Washington shuttle flight. Buy the book to keep you company between New York and Chicago or St. Louis.

* * *

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ANADEMS

Phantasia Press (5536 Crispin Way, West Bloomfield, MI 48033) is now advertising a Fredric Brown omnibus, **And the Gods Laughed.** It's got over 70 stories in 400+ pages (remember that Brown was a master of the short-short), with several stories in book form for the first time. The price is $19.00, unless you want one of the 475 autographed copies, available because Brown once signed a number of sheets to be tipped into another book. But the sheets arrived at the printer too late to get into the book, Shasta warehoused them, and Phantasia's Alex Berman got his hot little mitts on them, spotted an opportunity, and took the occasion to do all Brown fans a very large favor.

Zenna Henderson's **The People: No Different Flesh** is available again, this time from Avon. If your old copy is tattered and torn from many readings, spend the $3.50 to replace it. If you never met the People before, then please, *please*, rectify this deficit in your education. Henderson had a gift for love, and her supreme talent was transferring that gift to the printed page.

And finally, I was very pleased to see that Joan Slonczewski's **A Door into Ocean** won the 1987 John W. Campbell Memorial Award. I hope you all took my advice (in the August 1986 column) and read it. If you didn't, do so now. ■

●The truth is that those who have never entered upon scientific pursuits know not a tithe of the poetry by which they are surrounded.

Herbert Spencer

●Science is the most intimate school of resignation and humility, for it teaches us to bow before the seemingly most insignificant of facts.

Miguel De Unamuno

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brass tacks

Dear Mr. Schmidt:

It's about time Christianity got some positive coverage in a non-religious magazine—and I want to thank you for having the courage to publish Arlan Andrews's "Epiphany." I also want to thank him for having the courage to write and submit it.

As a freelance writer, I understand editors' concerns about publishing something that may clash with popular belief. But as a Christian, I get awfully tired of Christians being portrayed as misguided bumpkins—or worse. We aren't all weird; some of us have some common sense and even a sense of humor.

Besides being a good read, Mr. Andrews's story gave us some pretty sound theology on a level anyone can understand.

Gentlemen, my thanks. When can we expect more?

JONNI GORITY

Springfield, VA

Dear Mr. Schmidt:

Gotcha! Just finished reading Timothy Zahn's story "Banshee," in your September 1987 issue. The story was fine, *But:* you will never see a DC-9 with an inboard wing engine. Two in the rear, that's all. Also, Air Force One wouldn't be called a DC anything, it'd be a military designation, C-something or other. Finally, DC-9's aren't even made anymore. McDonnell-Douglas does make a derivative it calls the MD-80, but it's got two engines in the back also. Since the story is laid out in the future, it seems unlikely the president would go back to an older model. Are you and Mr. Zahn sure you didn't mean a Boeing 747, by whatever designation they settle on when the new one is ready (soon now, according to the papers)? Right now, both Air Force One's are drastically modernized C-135's, the old Boeing 707. Of course, whatever the president is riding in can be called Air Force One, but I still don't believe in wing mounted engines on a DC-9. And neither did the artist, although I think that's a C-135 rather than a 747. Nice to see an illustrator who read the story first, though.

Seriously, I did enjoy the piece, as I do most of the work you select for *Analog*. Zahn almost always writes a good story. Keep up the good work.

MICHAEL A. WINTERS

9711 Lawngate
Houston, TX 77080

Dear Stanley:

I believe Ms. Silbar, in "Cellular Automata" in the September *Analog*, has made a slight error in discussing the number of possible relationships among a group of objects. She has the numbers right (e.g. there would be 90 possible relationships among 10 objects) but says the number goes up as the square.

The number of possible connections among n objects is $n(n-1)/2$. This is the formula for triangular numbers, $n(n+1)/2$, displaced by one integer. Since the number of connections is zero when $n=1$, the series runs 0, 1, 3, 6, 10, 15, 21, 28, 36, 45 . . . The number of connections among 10 objects is therefore the tenth number of the series,

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or 45. Since Ms. Silbar reckons each connection as embodying two relationships, one in each direction, the number of relationships is twice 45 or 90.

The corresponding series of square numbers is 1, 4, 9, 16, 25 . . . , the tenth being 100, twice which is 200. If we start the series with zero (the square of zero) the tenth number is 81, twice which is 162.

L. SPRAGUE DE CAMP

Dear Stan,

My thanks to you and Ben Bova for the September guest editorial ("For Mars, Vote *No*"). I think that Mr. Bova is quite correct that, while a glamor project like the Mars mission may make it easier to drum up support for the space program in the short run, it will no more get us a sustained space effort than did Apollo. While some space enthusiasts may object to sullying such a noble venture as space with crass profit motives, the only feasible alternative to a space program yielding tangible "Real World" benefits is for "pure" space enthusiasts somehow to amass the billions of dollars necessary to finance the program themselves—good luck.

For anyone wanting more background on the relationship of the space program and the "Real World," I highly recommend Walter A. McDougall's . . . *The Heavens and the Earth: A Political History of the Space Age* (Basic, 1985). While someone as actively involved in the space program as Ben Bova was might not learn much from it, I think it should be required reading for all of us (pardon the expression) "baby boomers"—those of us who grew up with the space program but were too young to be aware of the political machinations surrounding it. It covers the Soviet program as well as the American, is wonderfully well written, and deserves a much wider audience than it appears to have gotten so far.

SONDRA VENABLE

New York, NY

Dear Mr. Schmidt,

Greetings from a heretofore silent reader. Kudos to you for continuing a grand tradition with *Analog*, the only SF mag to which I have ever cared to subscribe. Not to knock the others, but I reckon I prefer the "harder" science. Been reading SF since about '51; sorta miss the old "Space Westerns."

Just read "No Damn Atoms" in the October issue. Interesting concept of competition of technologies in an arena of competition. It is unfortunate that the authors apparently never learned much about car racing, be it the organizations which sanction racing, the physics/mechanics of conventional cars, nor the psychology of racing drivers.

Formula One is an international series, and it would have been appropriate for such names as Lotus, Brabham, Honda, Ferrari, et al. to be mentioned, along with the predominantly foreign driver names; Americans have not been well represented. The nicknames for the cars, if not the drivers, haven't been common for twenty years.

A car with appreciably more horsepower, less weight and equal or superior handling will run off and hide from the competition, and only be blocked when it is lapping slower traffic. F still equals MA, as I recall. . . . Deliberate blocking will result in black-flagging for penalty by any sanctioning body in racing, other than some of the minor-league tracks. It is unsafe and is quickly punished; the improvements in all facets of track safety have been a worldwide trend for many years. It seems such a trend would continue. A dozen or so

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years ago, the Sports Car Club of America published an article on the psychology of race car drivers, and differentiated between amateur and professional drivers. Professional drivers are way above average in their self-control. The ability to survive speeds above 200 mph mandates precision, concentration, and self-discipline. People like that don't riot.

The present $10,000,000 per car per year Formula One effort is controlled by bean-counters. Show a bean-counter a more cost-effective power plant, and they will be in all cars PDQ. Show a racer a new toy, and he or she will want one!

I guess being around car racing for thirty years will make one picky. I liked the basic concept, and agreed with the ending. Maybe a little too much mellerdrammer in the middle.

ARTHUR L. EATMAN

Terlingua, TX

Dear Stan,

In reference to the letter from Frank Van Alstine and Arthur Eatman, and no doubt others you have or will receive: mea culpa! (These are my errors; Bill Wu is in no way implicated.) It would not have been difficult to have learned that Formula Ones are not the cars run in long oval races. There is no excuse. As was evident, I had the Indy 500 in mind, but of course was careful not to specify, partly because of a lack of knowledge of the fine details, partly for such obvious considerations as the libel laws.

As for blocking, I'm happy to learn how stringently it is forbidden. But even had I known, I think I would have used it. Reason: the race is not the story. Both Mr. Van Alstine and Mr. Eatman are members of the "keyhole audience," as they admit: they have never been moved to write before. This of course does not invalidate their points, but they show little comprehension of the purpose of story-telling.

This purpose is evident in a comparison of comments from each letter. Mr. Van Alstine observes that "Formula One, by definition, means an exact engineering specification set" in which "Engine displacement, fuel standards, and other engineering parameters are tightly regulated. There is not a chance that an alternate engined machine could compete."

Mr. Eatman says: "Show a bean-counter a more cost-effective power plant, and they will be in all cars PDQ. Show a racer a new toy, and he or she will want one!"

I agree with both comments (only remarking that my use of Formula One was an error, and that alternate-engined cars *have* run at Indianapolis). These statements can both be true, but not simultaneously. There will be a period of contention during which the conservatives will hold out for the familiar and the radicals will argue for the new. In reality, I suppose this battle would be fought in boardrooms and offices—maybe even in court. As Bill and I know to our sorrow, to discuss the effects of radical new ideas on society tends toward a "talking heads" story. We chose to present this conflict in terms of a disputed race and a riot.

I have known many mechanics over many years, beginning with my two brothers, and have often discussed alternate engines with them. The invariable pattern with mechanics was blank surprise at the *idea* of an alternate engine, followed by uneasiness that usually masked fear and hostility. To do them justice, most mechanics overcame their feelings and developed an interest in the subject. Their feelings are quite

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understandable; they had all invested years in training and hundreds or thousands of dollars in tools for the conventional engine.

Other points, particularly in Mr. Eatman's letter, I find fascinating. The Sports Car Club of America's study of the psychology of racing drivers, particularly. I must question Mr. Eatman's conclusion, however, though he may well be right. He observes that "The ability to survive speeds above 200 mph mandates precision, concentration, and self-discipline. People like that don't riot." However, experimental test pilots require the same self-discipline and control, but as Tom Wolfe tells us, in the fifties the test pilots from which the astronauts were drawn were a wild and crazy bunch when not flying their planes—given among other things to driving hot cars fast on back roads, very badly. The human ability to compartmentalize the mind is evident here.

Mr. Eatman may be right about today's racing drivers, though; Hunter Thompson interviewed the pilots at Muroc in the mid-seventies and found them as sober and dull as so many accountants. I suppose this is because the profession of test pilot was about twice as old in the seventies as in the fifties, and had come under the control of "bean-counters." As Mr. Eatman tells us that racing has today. However, the rioters were mostly pit crew—mechanics.

So Formula One racing costs ten million dollars per car per year. And this is not the extent of the investment in racing, as Formula One is not the whole. The investment is made by car companies, parts companies, and oil companies. I wonder what the total national investment in racing is—and how it compares, say, to NASA's budget? Too bad the investment is mostly in advertising rather than research, or we might have had that alternate engine twenty years ago—if not actually a nuke!

ROB CHILSON

To Whom it May Concern:

Sirs, I do protest this outrage, and I do protest it vehemently! Mr. Easton has been treated most unfairly in his attempt to bring some rationality to the MAD condition of the human race. Messers. Swenson and Ledbetter need a kick to their non-historical posteriors to remind them that when the United States was as young as the Soviet Union it was involved in a concerted effort to exterminate the native Indian tribes in this country. They need to read of how Indians were shot for sport from the backs of trains; how Indians and Chinese were casually shot as they walked too near Virginia City, Nevada.

A close look at the U.S. Constitution will reveal no mention of the condition of slavery existing at the time it was written. The ownership of another human being was a way of life for a significant section of this nation. There was no "maximum of individual freedom" if your skin was black, red, or yellow.

Northwest history is replete with stories of the Chinese labor gangs used to build the railroads while being held in virtual slavery until the tracks were laid. A more recent circumstance is the fact of American citizens being put in concentration camps because they were of Japanese ancestry, not for any crime or disloyal behavior.

Have the two "gentle" men ever read of the sweatshops in our cities that employed women and children who worked up to 16 hours a day, six days a week? It was less than 60 years ago. If they can achieve some distance from the shrill righteousness of their nationalistic prejudices, they might do some homework to begin to free themselves and

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consider our common humanity.

The United States is made up of individuals from diverse nationalities who came to this country with a common goal: To achieve here what they could not achieve in their native country. They wished to break out of the rigidities of an old culture that bound them to socioeconomic positions from birth. In America they could be something other than what their parents had been.

Now consider the experiment in socialism/communism attempted in Russia. The Communists are trying to remake an old culture into something very different. A much more difficult task compared to the making of America. The history of Russia gives us clues as to the impossibility of the task and why a Stalin could exist as long as he did and why the repressions exist as they do as well as the forms they have taken.

If we can learn to discriminate between the will of the people and the bent of governmental power, we would know to trust the former because it is the same the world over, and view the latter with constant suspicion because it sends us to kill our brothers and sisters with the reason of unreason.

Let this be the basis for eternal vigilance.

Suggested Reading:

Brown, Dee. *Bury My Heart at Wounded Knee*, New York, Holt, Rinehart and Winston, 1970.

Ginsberg, Ralph. *100 Years of Lynching*, New York, Lancer Books, Inc., 1962.

Wheeler, Sessions S. *Paiute*, Caldwell, The Saxton Printers, Inc., 1967.

HANK DeVOSS

Otis, OR

Dear Dr. Schmidt:

As a subscriber and reader of *Analog/Astounding* for over 50 years, I hope I will be permitted to express myself on a matter of great concern. I've never had a letter in Brass Tacks before.

In the October issue, Tom Easton was unfairly attacked by three Cold Warriors for daring to express his views in his book review column. Tom is fully able to defend himself on this, and I would not presume to speak for him. But as an M.D., I have a professional and ethical responsibility to speak out on matters affecting human health; and the greatest threat to human health that has ever existed, by far, is that of a nuclear holocaust.

This has been amply documented in a recent symposium on "The Medical Implications of Nuclear War" organized by the Institute of Medicine under the auspices of the National Academy of Sciences.[1] A nuclear holocaust would be unlike any war in history; hundreds of millions would be killed, or subject to hideous injury from falling debris and flying shards of glass, excruciatingly painful second and third degree burns for which no medical treatment would be available, or the debilitating effects of radiation sickness. Because civilization as we know it would itself be destroyed, the long-term effects would be equally bad; survivors would suffer from hunger and starvation, epidemics of infectious diseases now held in check, and the darkness and cold of the nuclear winter.

This is a mega-disaster that is just waiting to happen, and that almost certainly *will* happen if we continue on our present course. Yet the superpowers continue to build more and better nuclear weapons, and to extend the arms

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[1]*The Medical Implications of Nuclear War*, National Academy Press, Washington, D.C., 1986.

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race into space, in the absurd belief that this makes them *more* secure!

Cold Warriors often acknowledge that a nuclear war would be "bad," but they refuse to face the implications of this fact. As Dr. Kenneth Boulding has pointed out, for deterrence to work there has to be a finite probability that nuclear weapons will be used—otherwise it would not deter. The mathematical implications of this are obvious.

We simply *must* stop and reverse the nuclear arms race if our species is to survive. This means that we *must*, somehow, end the Cold War, and find a way to "live and let live" with the Soviets. We have already done this with Communist China.

To do this, we must set aside the fear and hate (on both sides that has dominated for 40 years, and make a new approach. For Americans, this means *reaching out* to the Soviets—including Communist Party members—and trying to understand them as human beings. There is an old Indian saying: do not condemn a man until you have walked a mile in his sandals. A growing number of Americans are doing just that; and we find that the *concrete reality* of the USSR is quite different from the way it is depicted by the Cold Warriors. It is an imperfect society, and far behind the U.S. economically; but its people have much more freedom than is generally realized. Above all, theey know what war is like; the Soviet people have been through hell—20 *million* killed in World War II. They genuinely like Americans—it is the U.S. government and the Cold Warriors that they fear. The first day of school is dedicated to peace! They teach their children that war is hell, that a nuclear war would destroy mankind, and that they *must* work for peace!

And so must we all. Because if we don't, sooner or later an accident will happen, or somebody will make a mistake, and nothing will matter anymore.

N. ARTHUR COULTER, M.D.
Chapel Hill, NC

Dear Sirs:

I don't write letters often, but this *I gotta do*. I just got a request from "the Planetary Society" for $ for membership.

The sons of ———'es disguised it as a survey, but only those agreeing with their point of view and wanting membership get to submit their opinions.

I refuse to be sucked in by such an idiotic policy. I sincerely wish that the NASA budget, along with civilian exploration of space, would be expanded. I *resent* the close mindedness in that survey.

I do want to say thanks to *Analog* for an earlier editorial about this very subject. Mars is cute, but closer, more practical exploration is a definite first step.

What do you think?

JACKIE and CRAIG LANE
Torrance, CA

My view of these "surveys" with all leading questions and the last asking for money, is very much like yours. Unfortunately they seem to have become quite fashionable lately, much as bubonic plague once did. The society you name is only one of several I've seen using them, all of which should know better. For a scientific organization to misrepresent is one of the best things they could do to alienate precisely those intelligent and thoughtful people they're trying to reach.

Let's hope some of those responsible see this in "Brass Tacks" and demand a more responsible reproach. ■

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a calendar of analog upcoming events

6-8 May
CONJURATION V (Oklahoma SF conference) at Holiday Inn Holidome, Tulsa, Okla. Guest of Honor—Lawrence Watt-Evans, TM—R.A. Jones. Registration—$10 until 18 April, $13.50 at the door. Info: Con-Juration V, 1944 S. Garnett, Tulsa OK 74128. (918) 438-3336.

13-15 May
KUBLA KHAN 16 (Nashville area SF conference) Info: Kubla Khan 16, % Ken Moore, 647 Devon Dr., Nashville TN 32720. (615) 832-8402.

13-15 May
MISCON 3 (Montana SF conference) at Missoula, Mont. Guest of Honor—Greg Bear, Artist Guest of Honor—David Cherry, Fan Guest of Honor—Cindy McQuillin. Registration—$15 until 15 April, $18 at the door: $10/day at the door. Info: Miscon 3, Box 9363, Missoula MT 59807.

20-22 May
KEYCON 5/CANVENTION 8 (Canadian SF conference) at Holiday Inn Winnipeg Downton, Winnipeg, Man. Guest of Honour—Gene Wolfe, Honoured Guest—Charles de Lint, Artist Guest of Honour—Kevin Davies, Fan Guest of Honour—Fran Skene. Registration—C$20 (US$17) until 30 April, C$25 at the door. Info: Keycon 5, Box 3178, Winnipeg MB CANADA R3C 4E6.

27-30 May
DISCLAVE '88 (Washington, D.C. area SF conference) at Sheraton Hotel, New Carrollton, Md. Guest of Honor—Barbara Hambly, Art Guest of Honor—Jim Burns. Registration—$20 until 1 May 1988, $25 at the door. Memberships: Kent Bloom, 1802 Sanford Road, Silver Spring MD 20902.

27-30 May 1988
International Space Development Conference at Stouffer Concourse Hotel, Denver, Colo. Theme: Space: The Next Renaissance. Registration—$90 until 1 May, $105 thereafter; $60 until 1 May, $75 thereafter if a member of National Space Society, Space Studies Institute, AMSAT, American Space Foundation or one of the other co-sponsors: for details call (303) 692-6788. Info: 1988 ISDC, Box 300572, Denver CO 80218.

19 June-31 July
Clarion West Writers' Workshop at Seattle Central Community College. Writers-in-residence—Orson Scott Card, Elizabeth Lynn, Greg Bear, Joan Vinge, Gardner Dozois, Peter S. Beagle. About 20 students will be selected from all applicants. To apply submit 20-30 pages of manuscript with a cover letter describing your background and reasons for wanting to attend with a $50 refundable deposit payable to Clarion West. Tuition until 1 March—$925; applications considered up to 15 April 1988 but tuition is $975. For information write to: Clarion West, 340 15th Avenue East, Suite 350, Seattle WA 98112.

1-5 September 1988
NOLACON II (46th World Science Fiction Convention) at Sheraton Hotel & Towers, Marriott Hotel, Rivergate Convention Center, New Orleans, La. Guest of Honor —Donald A. Wollheim, Fan Guest of Honor — Roger Sims TM—Mike Resnick. Registration —Attending $60 until 31 December 1987, $70 to 10 July 1988. Supporting —$30. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer. Info: Nolacon II, 921 Canal Street #831, New Orleans LA 70112 (504) 525-6008.

—Anthony Lewis

Items for the Calendar should be sent to the Editorial Offices six months in advance of the event.

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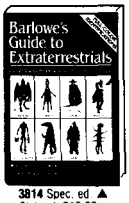

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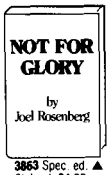

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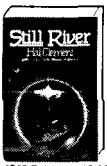

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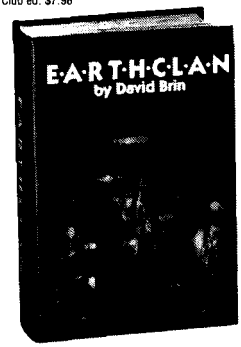

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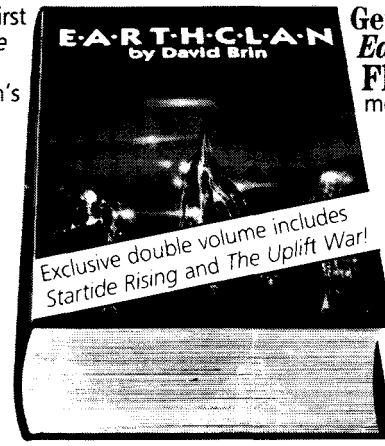

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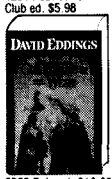

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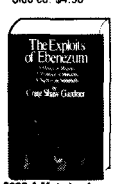

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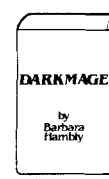

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